Gordon Institute of Business Science
University of Pretoria

Factors influencing the adoption of mobile data at the bottom of the pyramid in South Africa

Yogan Govender

GIBS student #439372

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

9 November 2015

Abstract

The mobile telecommunications industry has revolutionised the global economy, enabling advancements, innovation and increasing information flow across almost all sectors of the economy. Mobile telecommunication has bridged the digital divide in many rural and informal communities, allowing people in this segment to access products, information, services and social interactions.

The Bottom of the Pyramid (BoP) relates to the socio-economic group of people living on less than $2 per day. These consumers are characterised by distinct consumption patterns, purchasing patterns and price sensitive consumption. Mobile telecommunications made up of voice and data services form part of the consumption of BoP consumers.

The objective of the research was to investigate the factors that influence the adoption of mobile data services at the BoP in South Africa. The study was approached from the BoP consumers' perspective and followed a quantitative method, with a sample being drawn from the informal settlement of Diepsloot. The target sample was individual mobile phone users.

A conceptual framework was developed from the constructs identified in the literature review, which consisted of Perceived Usefulness, Perceived Ease of Use, Subjective Norm, Availability, Affordability, Awareness and Acceptability. The framework was then tested in the informal township of Diepsloot.

The study revealed that not all factors explored are significant predictors or influencers of mobile data services adoption at the BoP in South Africa. The study highlighted the factors of Perceived Ease of Use, Subjective Norm and Availability as being those that do not influence the adoption of mobile data services at the BoP in South Africa, while Perceived usefulness, Awareness, Affordability and Acceptability, were highlighted as influencers of mobile data services adoption at the BoP in South Africa.

Keywords

Bottom of the Pyramid (BoP)

Adoption

Mobile telecommunication

Mobile data services

Mobile Network Operators (MNOs)

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other university. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

_____

Yogan Govender

Date: 09 November 2015

Table of Contents

List of figures

List of tables

Chapter 1: Research Problem

1.1 Introduction

Mobile technology comprising of voice services and data services has been a key economic enabler for low income markets in Sub-Saharan Africa (Chavula, 2012; Linna, 2012). Mobile Network Operators (MNOs) providing mobile telecommunications services of both voice and data services have penetrated these markets to ensure that they not only provide a much needed service, but also access new markets for revenue. Access and use of mobile communication services has transformed the day-to-day activities of the billions of people living on less than two dollars a day (Anderson & Billou, 2007; Prahalad & Hammond, 2002) .

This market of consumers that survive on under two dollars per day has been coined the “Bottom of the Pyramid” (BoP), and have for years been the focus of many researchers and firms to understand consumer behaviour and patterns in order to service this segment (Prahalad, 2005; Prahalad & Hammond, 2002; Prahalad & Hart, 1999). A study by Zainudeen and Ratnadiwakara (2011) on the adoption of mobile services amongst BoP consumers in Asia described the term “more-than-voice” as being services and applications that are accessible though mobile phones beyond normal voice and peer-to-peer short message services. These ‘more than voice’ services form the basis of what are called mobile data services, which are comprised of a multitude of mobile applications that provide up-to-date information services, weather updates, access to social networks, financial transactions and entertainment and gaming platforms. These mobile data services form the context of this study.

Numerous studies have been conducted to ascertain what factors or predictors influence the adoption of new technologies, services and products in various markets, and what drives consumers’ consumption of these services and products (Anderson & Billou, 2007; Chopra & Narayana, 2012; Nakata & Weidner, 2012; Prahalad & Hammond, 2002; Suki & Suki, 2011; Tobbin, 2010).

This research investigated the factors that influence the adoption of mobile data services in the BoP markets in South Africa in terms of the extended Technology Acceptance Model (TAM2) (Venkatesh & Davis, 2000) and the 4A model (Anderson & Billou, 2007) adapted for the purposes of this study.

1.2 Research Problem

The mobile telecommunications industry has become a major contributor to the global economy, adding US$ 2.4 trillion to the global gross domestic product (GDP) in 2013 (GSMA, 2014). Not only has mobile telephony and data increased GDP, but it has also transformed daily life in almost every country. With the increasing prevalence of smartphones, mobile data services have become very popular in the last decade (GSMA, 2014). Mobile Network Operators (MNOs) in many developing markets are competing on basic voice and text services (Deloitte, 2014; BMI, 2014) which are a cash cow for them, yet this has not only driven industry consolidation, but it has also forced MNOs to focus on other revenue streams for a sustainable, long-term operation. Much of the future revenues and growth for the MNOs are the mobile internet and mobile data service applications markets.

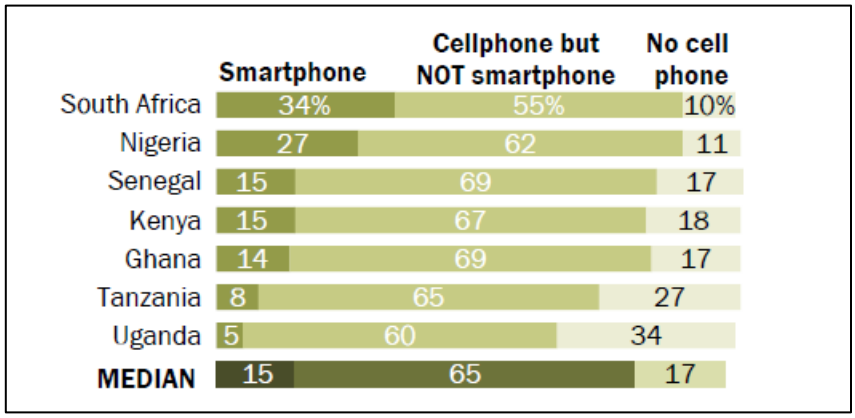
The telecommunication market is fairly developed in terms of mobile infrastructure (BMI, 2014; GSMA, 2014), however data revenue models are constantly being tested with regards to offerings and price plans to ascertain what the optimal level is to ensure profit and sustainability. A study by Pew Research Centre (2015) regarding cellular phones across seven sub-Saharan African countries indicated that SMS usage is still the highest utilised service, while other mobile data services are in the minority usage phase.

Although smartphone ownership in South Africa is around 34% of the population, SMS-based services are still the dominant platform, followed by camera and video usage, and finally mobile data services. The mobile data services ranked in order of usage (Pew Research Centre, 2015):

1. Accessing social networks
2. Searching and applying for jobs
3. Obtaining political information
4. Obtaining health related information and mobile money transfers (making or receiving payments via a mobile phone)
5. Obtaining consumer information

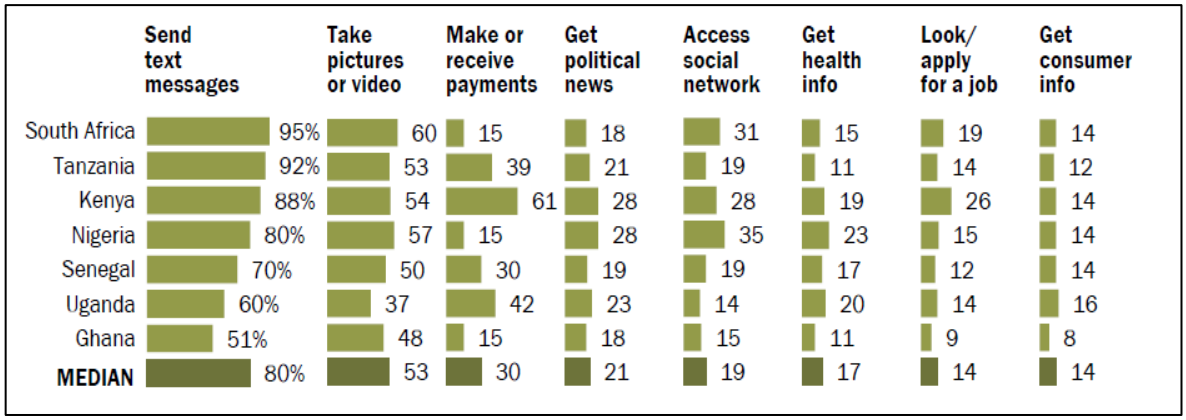
Figure 1 and Figure 2 below depict the smartphone penetration rate and mobile services utilised across the seven sub-Saharan African countries.

Figure 1: Smartphone penetration



Source: PEW Research Centre (2015)

Figure 2: Most common usage of mobile phones



Source: PEW Research Centre (2015)

Although these basic services have changed the economic landscape in these markets and have the further potential to increase economic growth in Africa (Chavula, 2012), there is a growing need to understand why mobile data services in these markets have not been fully adopted and utilised as compared to voice and text services.

By conducting this research, a deeper understanding as to what factors influence the adoption of mobile data services by customers at the BoP in South Africa was reached.

1.3 Research objectives and scope

The main objective of this research was to investigate the factors that influence the adoption of mobile data services at the BoP in South Africa. The evaluation of these factors provided a comprehensive understanding as to how MNOs can develop more robust and segment-specific mobile data adoption strategies and offerings to increase data penetration and usage in the BoP.

The study initially investigated and reviewed the existing literature, models, frameworks and industry information to formulate a conceptual research framework, which was tested and validated within the BoP market in South Africa.

This research ultimately provide MNOs with a clearer understanding from a consumer perspective at the BoP as to the consumer behaviour and purchasing patterns of these mobile data services, as well as identified the factors that can drive mobile data monetisation and influence the adoption of mobile services in the BoP market in South Africa.

Chapter 2: Literature review

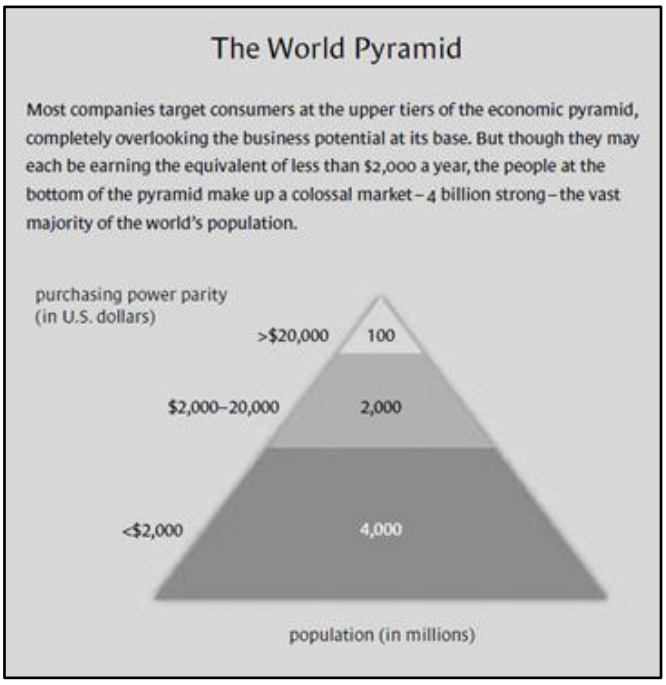
2.1 Introduction

This chapter defines the concepts of mobile data services, mobile data as an enabler for economic growth, the Bottom of the Pyramid (BoP) market, and the Technology Adoption Model (TAM), and assesses the literature that critically reviews various studies and theoretical frameworks. The concepts and frameworks explored will lead to a new conceptual research framework.

2.2. Bottom of the Pyramid (BoP)

The notion of the "Bottom of the Pyramid" (BoP) was first introduced by Prahalad and his colleagues, and focussed on the dual objectives of making profits and alleviating poverty at the base of the economic pyramid (Prahalad & Hammond, 2002; Prahalad & Hart, 1999). Prahalad and Hammond (2002) characterised the BoP as the foundation of the economic pyramid, comprising of four billion people who each earn less than $2000 per year. They advocated that this untapped market is a great source of profits for multinational companies. Figure 3 outlines the tiers of the BoP market.

Figure 3: BoP tiers



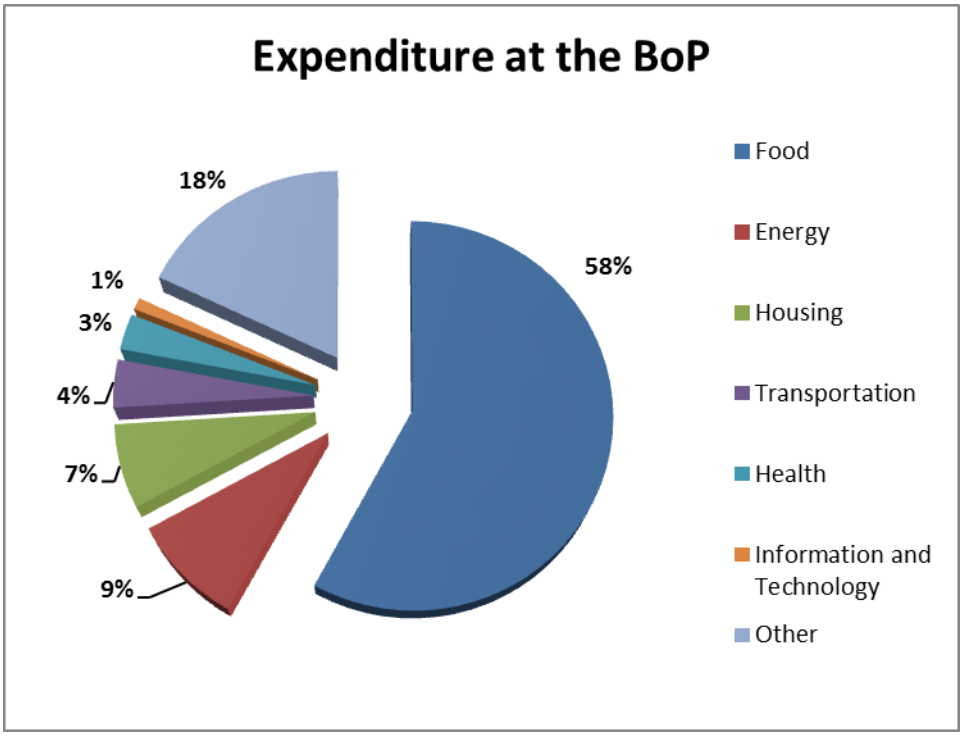
Source: Prahalad and Hammond (2002)

Yet Karnani (2007) argued that earnings can vary to be much higher than $2 a day for the cases stated by Prahalad and Hammond (2002). Karnani (2007) was also sceptical about the “fortune” at the bottom of the pyramid (Prahalad & Hammond, 2002), saying that there could be exploitation of this segment by multinational firms.

Karnani (2007) further commented that the BOP market is highly price sensitive, as consumers spend close to 80% of their income on food, clothing and fuel. Prahalad and Hammond (2002) and Karnani (2007) all agreed that the consumers in the BOP market are focused on firstly satisfying their basic needs and are thus highly cost conscious. Price and cost are, however, not the only factors to consider when addressing low income markets.

The basic needs of the BoP market are a critical area for businesses to understand if they are to appreciate what drives consumption at the BoP (Subrahmanyan & Gomez-Arias, 2008). According to Subrahmanyan and Gomez-Arias (2008), BoP consumption or expenditure can be categorised as depicted in Figure 4, where expenditure on information and technology is only 1% and the majority is on food (58%).

Figure 4: Expenditure and consumption at the BoP



Source: Adapted from Subrahmanyan and Gomez-Arias (2008)

Chopra and Narayana (2012) stated that if the motivation and basic needs of the BoP market are understood, this could lead to a better society and improved quality of life. The hierarchical framework that is utilised to understand the needs of the BoP is the framework by Maslow (1943), who's seminal work on human needs, motivation and behaviour proposed a five tier hierarchy of human needs presented as a pyramid:

1. Physiological – air, food, water, sex, sleep, warmth
2. Safety – security, stability and safety, resources
3. Love/Belonging – friendship, affection, family, relations
4. Esteem – self-esteem, confidence, status, reputation
5. Self-Actualisation - personal growth, creativity, self-awareness, knowledge

Chopra and Narayana (2012) mapped the human needs as described by Maslow (1943) with the aspirational needs of the BoP population and their inter-relatedness. Chopra and Narayana's (2012) study highlighted the importance of technology as an enabler for serving the basic needs of the BoP market, as well as how mobile internet, mobile services and technology can be utilised to elevate even customers at the BoP to the Self-Actualisation tier (Maslow, 1943).

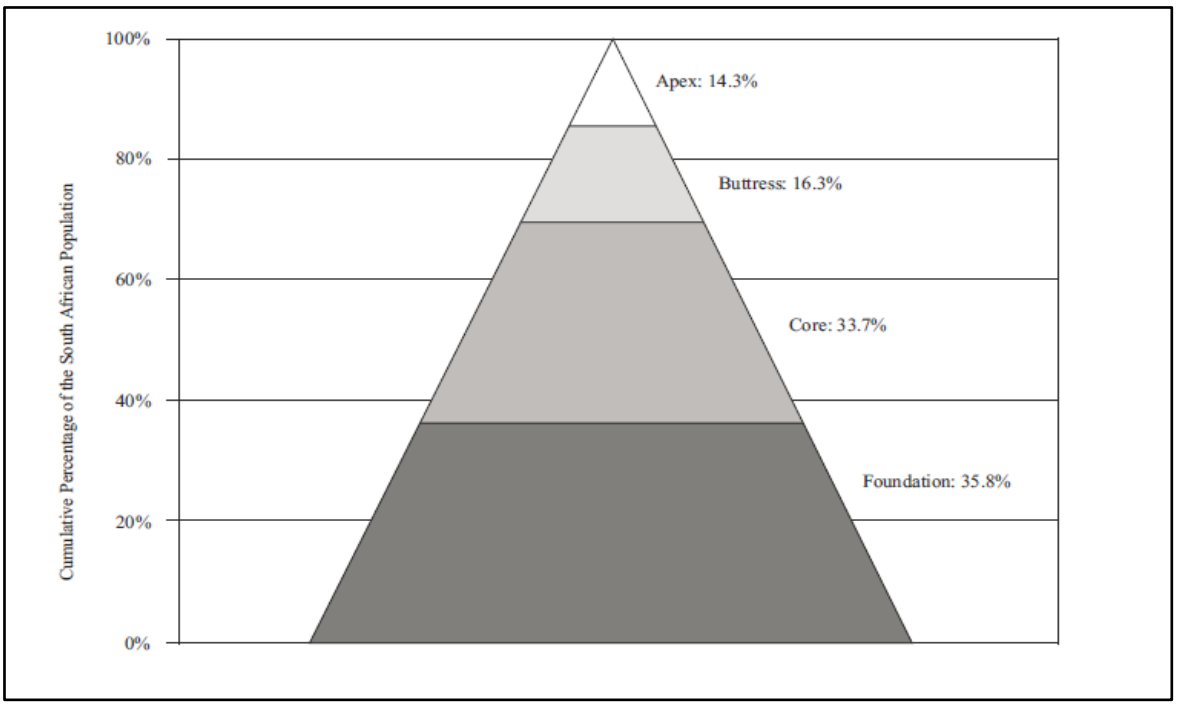
Although expenditure on information and technology is low at the BoP, Subrahmanyan and Gomez-Arias (2008) supported the notion of mobile communication and data usage at the BoP as an essential service that not only provides a social connection, but also allows BoP consumers to access information and services that would otherwise have been difficult to obtain. Subrahmanyan and Gomez-Arias (2008) further highlighted that BoP consumers are not only motivated by survival and physiological needs, but also seek to fulfil higher order needs to build social capital, for cultural reasons or as a compensatory mechanism. Data service offerings that fulfil these higher order needs thus have a greater chance of success in the BoP.

Chipp, Corder and Kapelianis (2012) argued that in the South African context, a BoP classification cannot simply be centred on the income levels of individuals, but rather on defining and identifying the BOP as a collective. Nakata and Weidner (2012) also classified consumers at the BoP as being interdependent on each other and belonging to a collective culture.

Chipp et al. (2012) further arranged the South African BoP tiers into four clusters (see Figure 5) as follows:

- The Foundation – forms the base and is South Africa's BoP, with 35.8% of South African adults constituting this tier.
- The Core – constitutes 33.7% of South African adults.
- The Buttress – constitutes 16.3% of South African adults.
- The Apex – constitutes 14.3% of South African adults.

Figure 5: The South African BoP tiers



Source: Chipp, Corder and Kapelianis (2012)

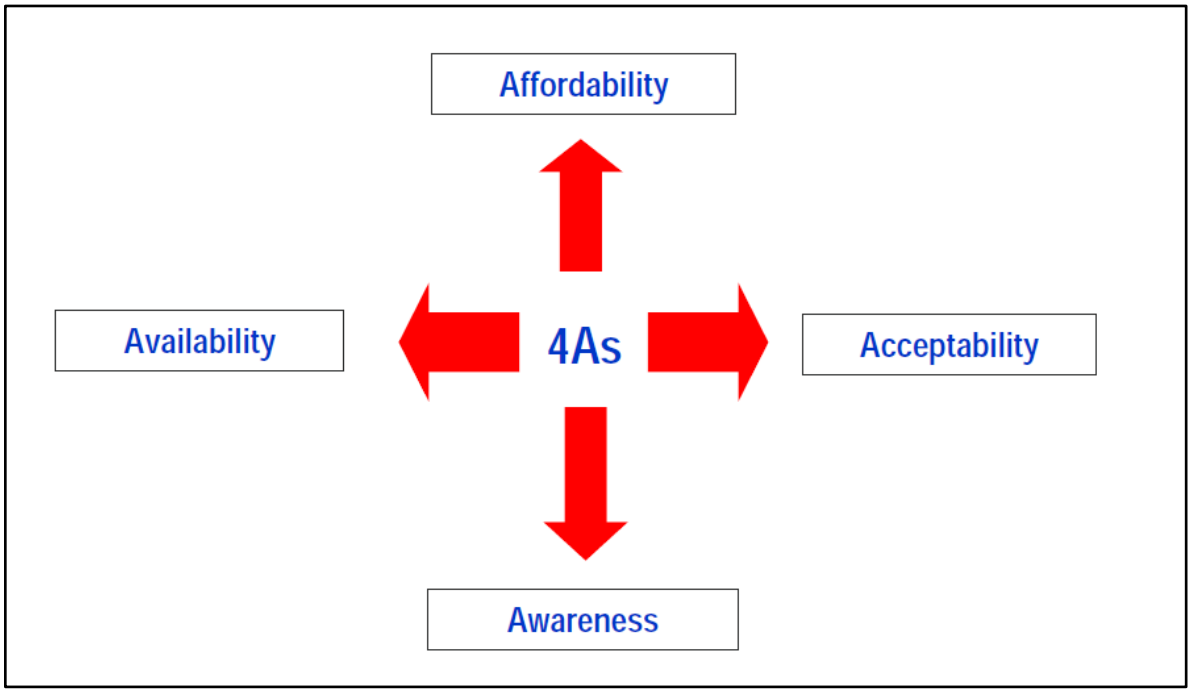
Chipp, Corder and Kapelianis (2013) further reinforced the collectivist approach at the BoP with a study that highlighted several variables that are proxy indicators to collectivism at the BoP. The most notable variable of household income as opposed to individual income in the BoP as a key descriptor of BoP classification is of great importance to marketers and businesses when considering the nature of consumer decision making and spending in this market.

2.3 4A framework

Although much literature has been published on the business opportunities and fortunes that exist at the BoP (Prahalad, 2005; Prahalad & Hammond, 2002; Prahalad & Hart, 1999), the success of firms entering these markets has been varied due to barriers to operation such as infrastructural and institutional voids, non-existent distribution channels, low levels of literacy, a lack of legal frameworks and even war (Anderson & Billou, 2007).

A study by Anderson and Billou (2007) was based on research from serving customers at the BoP and revealed a framework of 4As - Awareness, Availability, Affordability and Acceptability (see Figure 6) - which highlighted factors that firms need to innovate on or overcome in order ensure sustainability and success at the BoP.

Figure 6: 4A Framework



Source: Anderson and Billou (2007)

- Availability – the degree to which customers are able to easily acquire and use products and services in the BoP. Limited or even non-existent distribution channels in the BoP pose a great obstacle for the delivery of products and services to customers. Firms thus need to explore alternative methods of delivering their products and services to the BoP market.

  Anderson and Billou's (2007) case study on a Philippines mobile communications company, Smart Communications, explored the challenges it faced with regards to the distribution of mobile air time prepaid cards to non-urban and rural areas. Although Smart Communications had extensive mobile network coverage in the rural and non-urban areas, they were heavily dependent on medium sized store owners and mobile resellers to distribute air time. Their innovative solution to the problem was an over-the-air (OTA) payment system, Smart Load, which allowed even the smallest retailer or side shop owner to distribute air time vouchers

electronically without a physical prepaid card. This minimised physical product distribution and increase efficiency and revenue.

- Affordability – the degree to which a firm's products or services are affordable to the BoP customer. Many BoP customers in developing countries survive on daily wages, meaning that cash-flow can be a significant problem. For this reason firms need to be able to deliver offerings at a price point that enables consumption by even the poorest consumers.

  Cost and price sensitivity for BoP consumers are critical decision-making factors with regards to purchasing behaviour, and a major part of their meagre incomes are spent on essentials (SadreGhazi, 2008; Karnani, 2007; Prahalad & Hammond, 2002). Anderson AND Billou (2007) highlighted the approach that Smart Communication utilised to address this issue and noted that they adopted the strategies of Proctor & Gamble and Unilever, which developed low priced micro packs for this segment. Smart Communication reduced its prepaid air time vouchers to more affordable price points for the Philippine BoP market, which yielded excellent revenue figures.

- Acceptability – the degree to which consumers and others in the value chain trust or accept a product and service and are willing to consume, distribute or sell those products or services. In the BoP markets there is often a need to offer products and services that are adapted to the unique needs of both customers and distributors. Companies might need to respond to specific cultural or socioeconomic aspects, or to address the unique requirements of local business practices.

  The case study of the mobile network operator, Celtel, in Uganda, emphasised the challenges of the limited and erratic national power grid, which provided difficulties when recharging mobile phones. This lack of electricity reduced the acceptability of mobile phones as consumers could not derive the full benefit of them, but Celtel was quick to address the problem by providing low cost power generators to retailers and distributors so that consumers could recharge their mobile phones (Anderson & Billou, 2007).

- Awareness – the degree to which customers in the BoP markets are aware of a product or service. Building awareness can be a significant challenge for companies wishing to serve low-income consumers in the developing world due to inaccessible conventional advertising media platforms. Firms therefore need to utilise alternative platforms for media advertising reach.

  Anderson and Billou's (2007) case study on Smart Communications in the Philippines highlighted their non-conventional awareness programmes of investing heavily in billboards along roadsides in the BoP market, as well as point of sale advertising at the small retailers of air time and advertising on three-wheeler taxis in the rural areas. SadreGhazi (2008) focused on the awareness programme adopted by Nokia in India called 'Connect', which educated consumers about the different facets of mobile technology and helped consumers to improve their mobile experience.

  Hasan, Lowe and Petrovici (2015) argued that BoP consumers utilise more pictographic symbols than texts because of a low literacy rate, and that visual comprehensibility improves awareness of products and thus adoption of products and services within the BoP market.

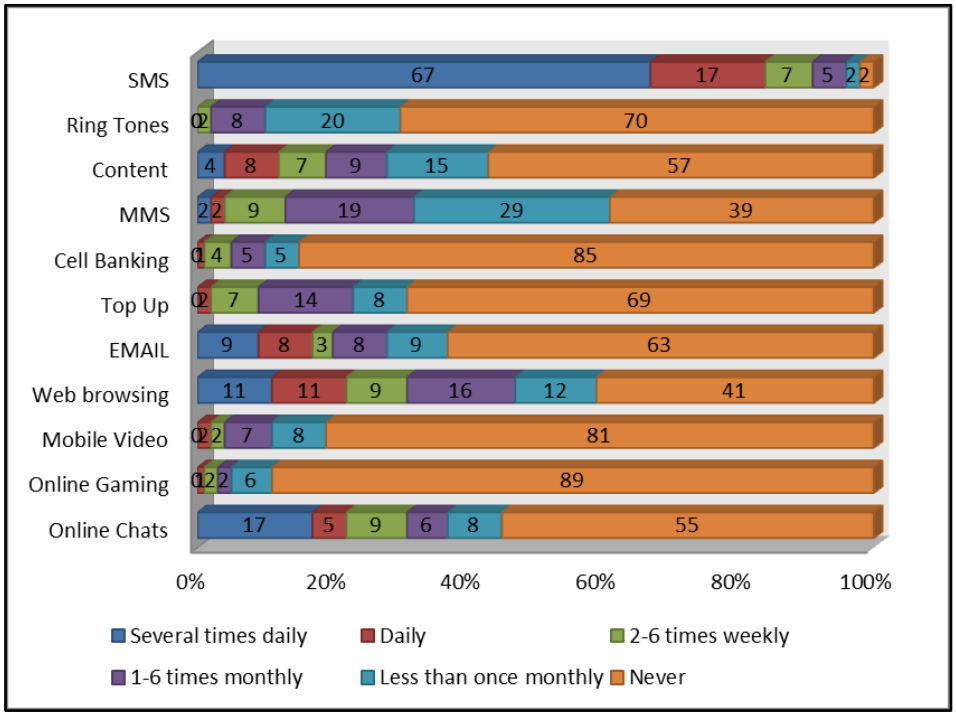
The above four factors form a relevant a base for this study on the adoption of mobile data services at the BoP.

2.4 Mobile data services

Technology development within the mobile telecommunication arena has led to the emergence of mobile data services (MDS), which refer to any non-voice or wireless access to an assortment of data services using a mobile phone (Bina & Giaglis, 2005). Kim, Choi and Han (2009) defined mobile data services as a wireless service to digitised content on the internet via mobile devices. Mobile data services are comprised of communication services such as the internet and email, entertainment, financial and transactional services, as well information services (Bina & Giaglis, 2005).

Ramburn and Van Belle's (2011) research amongst students and staff from a university and corporates in South Africa and Mauritius across various business sectors revealed that SMS usage was the highest utilised service and mobile data services adoption by users was generally slow. The usage patterns of these urban markets are depicted below (see Figure 7):

Figure 7: Usage of mobile data services



Source: Ramburn and Van Belle (2011)

Ramburn and Van Belle (2011) further revealed that the major factors encouraging the use of mobile data in this segment of the market are lower prices, a wider range of services than traditional services, and an increased awareness of new services. The study also highlighted the main factors for non-use of mobile data services in this market as being an increased cost of services, receiving illegal and harmful content, lack of a need or use, and leaking of personal information.

The mobile data services offerings can be classified as follows:

- Social Media Services – these data services contain mobile applications that allow for instant messaging platforms (IM) such as MXIT, WeChat, BlackBerry Messenger (BBM), social media connections and interactions by Facebook, Twitter and Instagram, which also allow for uploading of videos and photos onto a personal account.
- Financial Services - these include mobile banking and mobile money transfer platforms which use mobile data to facilitate financial transactions amongst consumers, retailers and entertainment businesses (e-tickets).

- Information Services – these services include web browsing; maps and directions; downloading of internet content; email services and accessing weather, sports, health and consumer information.
- Gaming/Music/Video Services – these mobile services allow for listening to music, viewing videos, and music and video downloads. Online gaming on mobile platforms can be regarded as a mobile data service.
- Advertising/Sales and Employment Services – these mobile services allow for mobile users to purchase or advertise goods and search employment listings via mobile applications such as Amazon, eBay, Gumtree, OLX Junkmail, JobServe, Pnet and Indeed.com.

2.5 Adoption and Acceptance Frameworks

Numerous theories on user adoption of technology have been used in the literature to explain the consumer adoption of technology. The models below have been applied to understand the adoption of numerous information service systems and other technologies.

- Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975)
- Theory of Planned Behaviour (TPB) (Ajzen, 1991)
- Technology Acceptance Model (TAM) (Davis, 1989)
- Innovation Diffusion Theory (Rogers, 1995)

The Theory of Reasoned Action (TRA) by Fishbein and Ajzen (1975) is one of the most widely studied models of attitude and behaviour, and suggests that behavioural intentions are influenced by attitudes and social norms. Ajzen (1991) further developed the Theory of Planned Behaviour (TPB) as an extension of the TRA, and factored in Perceived Behavioural Control to understand the factors that increase or decrease the difficulty of performing a behaviour (Ajzen, 1991).

Taylor and Todd (1995) expanded on the models of TRA and TPB to develop a model which broke down each construct of attitude, subjective norms and behavioural control into multi-dimensional constructs to develop a decomposed Theory of Planned Behaviour, which improves the understanding between belief structures and determinants of intention. Davis (1989), meanwhile, based the foundation of his work on the TRA to develop a technology adoption framework known as the Technology Acceptance Model (TAM). TAM states that behavioural intention to adopt technology is based on two beliefs:

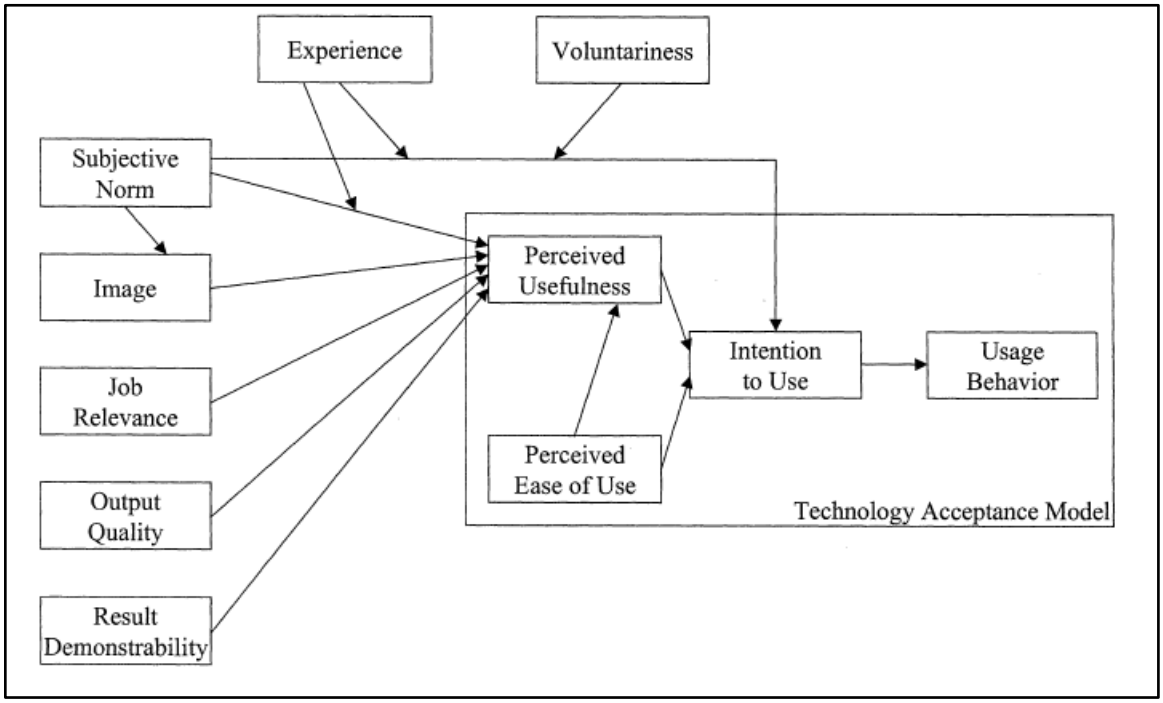
- Perceived Usefulness (PU) - defined as the degree to which a person believes that using a particular system or technology will enhance their job performance.
- Perceived Ease of Use (PEOU) - defined as the belief that using the technology will be free of effort.

These two beliefs create a positive intention toward using a technology or service, which consequently affects its adoption and use.

Venkatesh and Davis (2000) further established an extension to TAM, referred to as TAM2, which incorporated the additional constructs of social influence processes (subjective norm, voluntariness and image), and cognitive instrumental processes (job relevance, output quality, result demonstrability and Perceived Ease of Use). A subjective norm can be described as a "person's perception that most people who are important to him think he should or should not perform the behaviours in question" (Fishbein & Ajzen, 1975, p. 302) . Tan and Teo (2000) further associated subjective norm as being a function of the perceived social pressure to participate in a behaviour. Lee, McGoldrick, Keeling and Doherty (2003) linked the concept of "self-prestige" to that of subjective norm, whereby consumers of mobile data services felt a sense of self-prestige associated with performing transactions on a mobile data service, further highlighting the social perspective of the construct.

Legris, Ingham and Collerette (2003) highlighted significant factors that were excluded from the TAM model, which they stated need to be integrated into a more comprehensive model that would include factors related to the both the human and social change processes to technology adoption. Bagozzi (2007) also argued that the TAM omitted or neglected to include group, social and cultural aspects of technology adoption.

Figure 8: Extended TAM model



Source: Venkatesh and Davis (2000)

Rogers (1995) provided a framework known as Innovation Diffusion Theory (IDT) to explain consumer behaviour in adopting a new product or service and identified five main characteristics that influence the adoption of an innovation as follows:

- Relative Advantage – can be described as the extent to which an innovation is perceived to be better than the idea, product or service it replaces.
- Compatibility - how consistent the innovation is with the values, experiences and needs of the potential adopters.
- Complexity - how difficult the innovation is to use or understand.
- Trialability - the extent to which the innovation can be tested or experimented with before adoption.
- Observability - the degree to which the innovation provides tangible results.

Rogers (1995) suggested that diffusion is a process by which the innovation of products or services are communicated over time among members of a social system; innovation is a new use of an idea, process, or object by the unit of adoption; and the adoption process is the stages an individual goes through when deciding whether to accept or reject the innovation.

Tobbin (2010) explored the key factors that affect consumer behaviour towards the adoption and use of mobile money transfers in Ghana, and concluded that key constructs from the TAM model - Perceived Usefulness and Perceived Ease of Use - were the most significant factors influencing the adoption of mobile money services.

Suki and Suki (2011) investigated the factors of Perceived Ease of Use, Perceived Usefulness, Perceived Enjoyment and Attitude on the adoption and use of 3rd generation mobile services (3G services) in Malaysia. They concluded that Perceived Ease of Use, Perceived Usefulness and Attitude are significant factors for the adoption of mobile services, whereas Perceived Enjoyment did not feature as a significant factor.

In a mobile technology adoption study, Ismail and Masinge (2012) investigated the factors influencing the adoption of mobile banking services at the BoP in South Africa and also revealed that Perceived Usefulness, Perceived Ease of Use, Perceived Cost and Customer Trust in mobile services are significant factors that influence the adoption of mobile banking services in the BoP market. However Akturan and Tezcan (2012) concluded that only Perceived Usefulness directly affected the attitudes towards mobile banking services and was an influencing factor in the adoption of mobile banking services among students in Turkey, while there was no direct relationship with Perceived Ease of Use and Adoption of mobile banking services.

Zainudeen and Ratnadiwakara (2011) highlighted social influence as being one the main factors that influence the adoption of mobile data services at the BoP in Asia. Research by Hasan et al. (2015) supported Nakata and Weidner's (2012) findings that consumer adoption intention of technology and products at the BoP is more influenced by people around them, which reveals that subjective norm is a significant factor in this market. Tobbin (2013) further highlighted the importance of social factors, social influence and social networks in the influence and use of mobile money services in Kenya, which is associated with mobile data services adoption.

2.6 Mobile data services as an economic enabler

Hardy's (1980) pioneering work investigated the relationship between a basic telephone service and economic growth, and argued that telephone growth spurred economic development with the benefits of exchange of information and organisational efficiency.

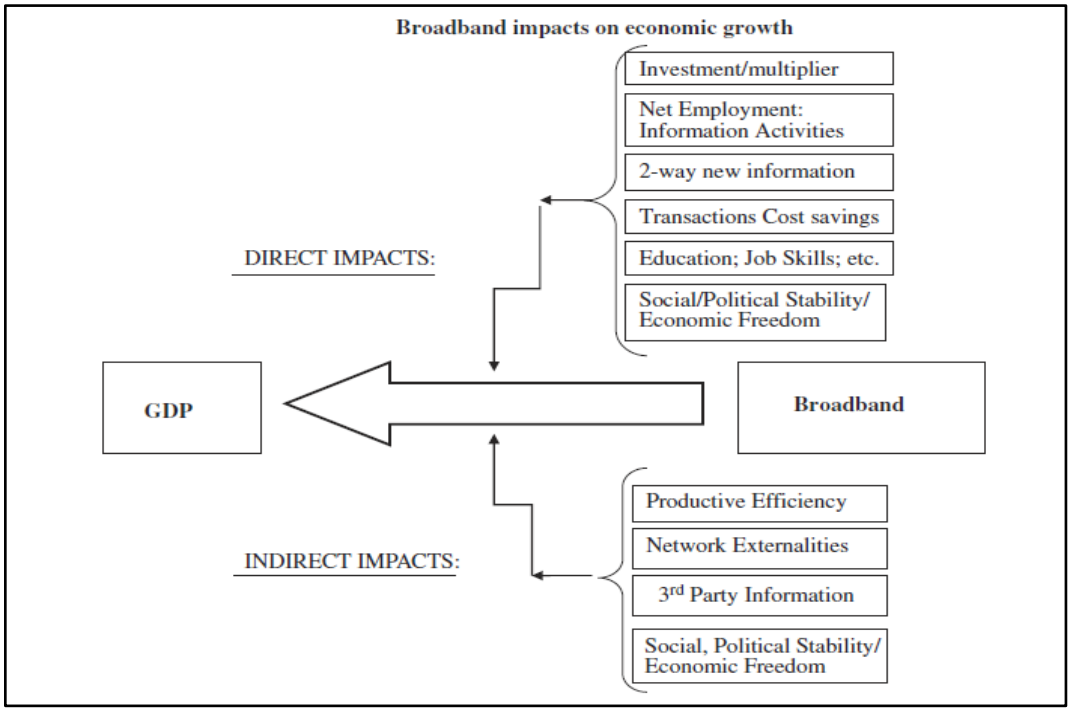
In a study of broadband introduction in member countries of the Organisation for Economic Co-operation and Development (OECD) from 1997 to 2007, Thompson and Garbacz (2011) revealed that the Gross Domestic Product (GDP) of a country increased between

2.7% and 3.9% after broadband introduction. Czernich, Falck, Kretschmer and Woessmann (2011) also highlighted that an increase in broadband penetration by a rate of 10 percentage points raised annual growth in per capita GDP by 0.9% - 1.5%. Although the study conducted on broadband technologies incorporated both fixed line and mobile broadband, Thompson and Garbacz (2011) argued that fixed line broadband was more prevalent within the countries investigated, however the economic effect resulting from mobile broadband diffusion can be greater.

Thompson and Garbacz (2011) further highlighted the possible positive direct and indirect impact of broadband services on economic growth incorporating both mobile and fixed line as follows (see Figure 9):

- Investment and development effects – new business, employment opportunities, basic and business education, and medical information
- Business management effects – more efficient transactions and information management
- Education – efficient education systems and platforms
- Increased Total Factor Productivity (TFP)
- Institutional efficiencies

Figure 9: Broadband impact on GDP



Source: Thompson and Garbacz (2011)

The deployment, maintenance and upgrading of a mobile broadband telecommunications network that supports mobile data services requires major capital investment in a country. Thompson and Garbacz (2011) supported Madden and Savage (1998), Röller and Waverman (2001) and Jacobsen's (2003) studies that revealed that broadband penetration rates (broadband usage) more directly precede economic growth than telecommunications capital investments. Their study highlights the importance of broadband usage as an economic enhancer and enabler of economic growth due to externalities and spill over effects.

Chavula (2012) researched telecommunications development and economic growth covering 49 countries in Africa and argued that telephone fixed lines and mobile cellular telephony have a significant impact on people's living standards in Africa, however internet usage does not significantly contribute towards economic growth in the upper-low-income and low-income markets - only mobile telephony. Chavula further revealed that although the prolific spread of telecommunications and mobile phones in Africa is evident, people and businesses have not fully maximised the opportunity to access the internet to carry out business activities, hence internet usage has failed to reach the critical mass of the continent.

Lee, Marcu and Lee (2011) found that mobile cellular service expansion is an important determinant of the rate of economic growth in Sub-Saharan Africa (SSA), and the contribution of mobile cellular technology and services toward economic growth and development is of growing importance to the region. Lee et al. (2011) further highlighted that the marginal impact of mobile telecommunications services is greater wherever fixed line telecommunications are scarce and the promotion of more mobile telecommunication services is high in SSA.

2.7 Conclusion

The literature review explored various concepts, frameworks and models, including the Bottom of the Pyramid (BoP), the 4A framework, mobile data services and technology adoption models, and delved into the literature pertaining to mobile data services as an economic enabler. The literature discussed formed the base for the research framework and propositions that are explored in Chapter 3.

Chapter 3: Research propositions

3.1. Research constructs

The purpose of this study was to assess the factors that influence the adoption of mobile data services in the BoP market of South Africa. The outcomes of the investigation of the constructs and their impacts provide the following benefits:

- Provide a consumer view of mobile data adoption and usage patterns at the BoP.
- Highlight focus areas of strategy development for MNOs based on the factors influencing mobile data adoption.
- Provide information for policy development on mobile data technology and future economic growth in developing markets.

The literature review highlighted and explored important constructs which were adapted within a research framework for the study (see Figure 5). The constructs are as follows:

- Perceived Ease of Use (PEOU) – this construct explores the easiness or effort involved in utilising mobile data services.
- Perceived Usefulness (PU) – this construct explores the benefit or advantage of utilising mobile data services.
- Subjective Norm (SN) – this construct investigates the social influence that impacts the adoption of mobile data services.
- Awareness (AW) – this construct investigates the level of awareness amongst BoP users towards mobile data services and its offerings, as well as awareness created by MNOs and businesses.
- Availability (AV) – this construct investigates the infrastructure, network availability and mobile network coverage at the BoP as well as support aspects with regards to mobile data services.
- Affordability (AF) – this construct explores the price and cost of mobile data services and cost structures in terms of offerings by MNOs and platform and content creators for mobile data products.
- Acceptability (AC) – this construct investigates the level of acceptance of mobile data services.

3.2 Propositions

3.2.1 Propositions based on TAM2

The proposition based on the TAM2 model proposes a relationship between Perceived Ease of Use (PEOU), Perceived Usefulness (PU) and Subjective Norm (SN) on the adoption of mobile data services.

- **Research Proposition 1:**

  P1: Perceived Ease of Use (PEOU) influences the adoption of mobile data services at the BoP.

- **Research Proposition 2:**

  P2: Perceived Usefulness (PU) influences the adoption of mobile data services at the BoP.

- **Research Proposition 3:**

  P3: Subjective Norm (SN) influences the adoption of mobile data services at the BoP.

3.2.2 Propositions based on the 4A Framework

These propositions are based on the 4A framework and propose a relationship between Awareness (AW), Availability (AV), Affordability (AF) and Acceptability (AC) on the adoption of mobile data services.

- **Research Proposition 4:**

  P4: Awareness (AW) influences the adoption of mobile data services at the BoP.

- **Research Proposition 5:**

  P5: Availability (AV) influences the adoption of mobile data services at the BoP.

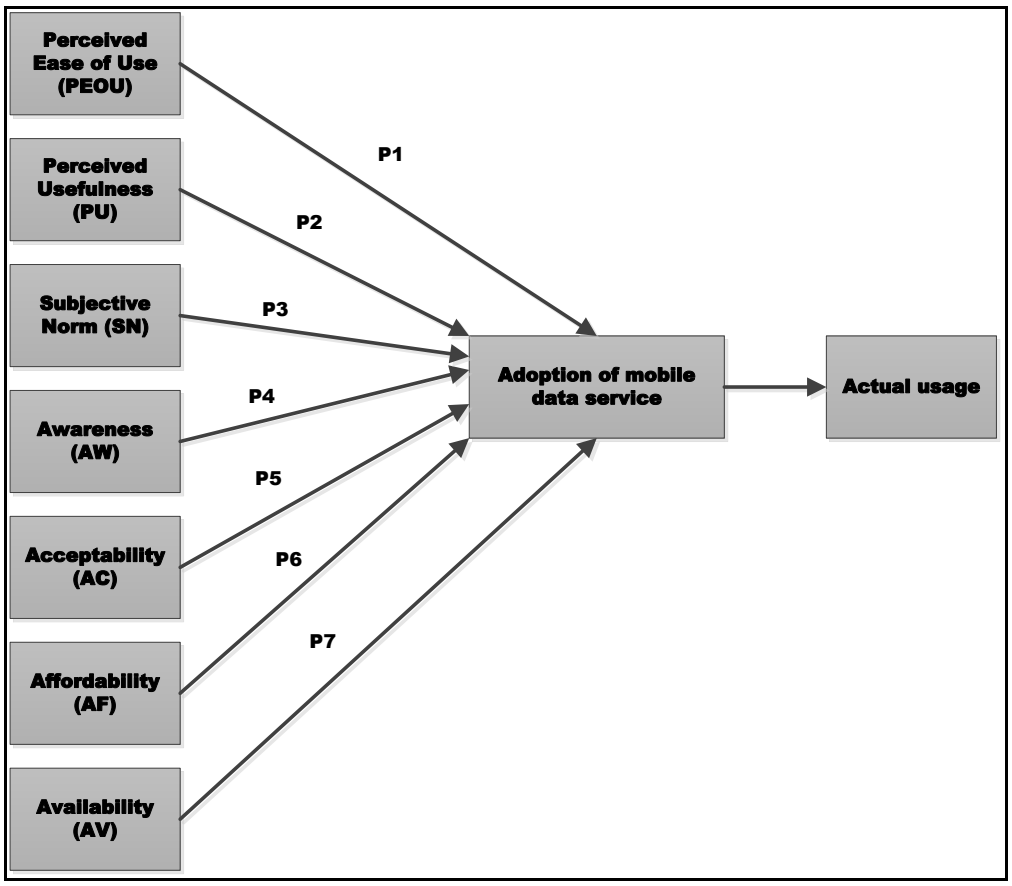
- **Research Proposition 6:**

  P6: Affordability (AF) influences the adoption of mobile data services at the BoP.

- **Research Proposition 7:**

  P7: Acceptability (AC) influences the adoption of mobile data services at the BoP.

Figure 10: Research Framework



Source: Adapted from Venkatesh and Davis (2000) and Anderson and Billou (2007)

Chapter 4: Research Methodology

4.1 Research design

Saunders and Lewis (2012) defined three types of studies that can be adopted for research:

- Exploratory studies: research that aims to seek new insights, ask new questions and assess topics in a new light.
- Descriptive studies: research that is designed to produce an accurate representation of persons, events or situations and tries to discover answers to the questions of “who, what, when, where”.
- Explanatory studies: research that focuses on studying a situation or a problem in order to explain the relationship between variables and tends to answer the question of “why”.

The research design was descriptive in nature and followed a quantitative study approach to test the assumptions of the relationship between the constructs (factors that are likely to influence the adoption of mobile data services) of the adapted research framework against the dependent variable of adoption of mobile data service in the BoP market. Descriptive research is also based on known knowledge of the subject matter as compared to exploratory research, where little is known on the subject (Saunders & Lewis, 2012). Primary data were generated via a questionnaire and statistical analysis was conducted to evaluate the relationships between the dependent and independent variables.

4.2 Population

The population for the study consisted of mobile phone users that fell into the BoP segment within South Africa. The BoP segment for the purpose of the study adopted the South African BoP classification (Chipp et al., 2012), but the research investigated the individual mobile user within the foundation tier.

4.3 Sample

Saunders and Lewis (2012) defined a sample as a subgroup of the whole population. The targeted sample for this study was the informal settlement of Diepsloot in Gauteng.

4.4 Unit of Analysis

The unit of analysis for the research was the individual mobile phone users within the BoP market.

4.5 Sampling method

The sampling method that was adopted was that of non-probability, quota sampling in order to target the individual mobile phone users within informal settlements. BoP mobile users within these areas were the targeted sample. Saunders and Lewis (2012) highlighted that in the absence of a complete list of the population, a non-probability sampling method can be utilised. Quota sampling can be described as a method where individuals are selected to ensure that the sample contains a sufficient number of individuals satisfying certain specified criteria (Saunders & Lewis, 2012). This type of sampling ensured that the respondents targeted would meet the criteria of mobile users living in the BoP and utilising a mobile device that had the ability to access mobile data services. Quota sampling thus ensured that the relevant data required for the study was obtained.

4.6 Research instrument

A questionnaire was designed for the study to test the constructs within the research framework. The questionnaire was divided into three sections. Section one obtained demographic details such as gender, age, income levels, cellphone ownership, network operator preference and airtime spend. Section two tested the usage of mobile phones as well as mobile data services. Section three utilised a five point Likert scale and delved into the constructs of the research. It comprised concepts that were included in the questionnaire to test the constructs in relation to the adoption of mobile data services. The five point Likert scale was coded as follows:

- 1 = Strongly disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly agree

4.7 Pilot testing

Pilot testing of the questionnaire was conducted to detect any flaws in the research instrument in terms of understanding of the questions; level of vocabulary utilised in the question design; and layout, design and structure of the questionnaire. Pilot testing revealed that the initial questions utilised vocabulary that was difficult to understand by the target market so the questions were made simpler for easier understanding. Association with applications such as WhatsApp, Facebook and Google were also included so that the targeted sample could better understand the notion of mobile data.

4.8 Data collection

The data collection method that was utilised for this study was that of face-to-face structured interviews conducted in Diepsloot by the researcher and three members of the Diepsloot Youth Forum. A community-based group was utilised to conduct interviews in order to address the time limitation factor of the study as well as to allow for an easier interview process, as the members of the Diepsloot Youth Forum were well versed in the local vernacular. To ensure valid data were obtained, training and briefing sessions were held to ensure that the field survey team fully understood the targeted sample for the study.

Since non-probability, quota sampling was utilised, the paper-based questionnaires were administered in the Diepsloot informal settlement by the researcher and the members from the Diepsloot Youth Forum over two weekends. The target market for the survey were approached at places of interest within the informal settlements such as taxi ranks, informal trading shops (spaza shops) and shopping centres around Diepsloot. Weekends were specifically selected so as to ensure that a high number of potential respondents could be accessed at one particular time.

4.9 Sample size

Wiid and Diggines (2009) discussed that when determining sample size, one of two methods can be utilised:

- Blind guesses – the researcher uses their judgement and intuition to determine sample size. This method does not consider precision of survey results or the cost factor.
- Statistical method – the method to calculate sample size is based on statistical formulae which consider the required level of confidence, the required precision (degree of accuracy of sample results), as well as the standard deviation of the population.

Based on an estimate of the total population of Diepsloot to be around 500,000 people (Census, 2011), when tolerating a margin of error of 5%, a confidence interval of 95% and estimating the standard deviation of the population at 50%, the required sample was 384.

4.10 Analysis approach

Statistics tools or methods assume certain assumptions, which means that the data used for the methods should be prepared to a level where they are aligned to the assumptions and produce a result closest to the truth. Four processes were employed to produce

results for the tests. Firstly the sample data were analysed for reliability, after which they were tested to ascertain if the constructs of the research were correlated and independent. Thereafter a regression model was used which assisted in the answering of the research questions. Before the regression model was built, a test for normality was conducted to validate the assumption of the regression model. After the regression model, the different factors were ranked by importance.

The following statistics tools were used for each process:

4.10.1 Understanding of the respondents

Descriptive statistics (mean, mode, range, kurtosis, skewness, variance and standard deviation) were used to understand the profile of the respondents. Wegner (2010) suggested that descriptive statistics summarise data in a useful manner so that patterns may emerge.

4.10.2 Studying the reliability of the response of questionnaire

Cooper and Schindler (2013) outlined that reliability and validity are important characteristics of the strength of the results, while Gliem and Gliem (2003) highlighted that Cronbach's Alpha is a tool used to estimate the reliability for a given test.

Factor analysis, as described by Fabrigar, Wegener, MacCallum and Strahan (1999), is outlined as a tool to group questions in a questionnaire into clusters of correlated questions or statements. This was used to measure the strength of the grouping of the questions and the constructs.

4.10.3 Studying the relationship of the factors

Correlation analysis was utilised to ascertain the strength of the association between Perceived Ease of Use, Perceived Usefulness, Subjective Norm, Awareness, Availability, Acceptability and Affordability. ANOVA was used to study the difference between groups' means and their association (Wegner, 2010). The different constructs were classified as groups and an ANOVA was conducted to study the difference and association between the answering of each construct. If the ANOVA results showed that the different constructs had different means, this indicated that the responses to the seven constructs were different.

4.10.4 Regression model

A test for normality (Histogram, Q-Q Plot, Kolmogorov test, Cramer-Von Mises test and Anderson-Darling test) was utilised to ascertain the strength of the regression model, and Linear Regression was used to determine the significant factors. Semi-partial correlation was also used to rank the seven factors.

4.11 Limitations

Utilising non-probability sampling meant that the sample would not be representative of the population statistically (Saunders & Lewis, 2012), thus the results cannot be generalised to the population as a whole.

The study was only conducted in the informal settlement of Diepsloot in Gauteng, thus excluding the other rural areas that could possibly represent the greater BoP segment of South Africa.

By utilising third party groups to facilitate data collection, the possibility of invalid data collected by the field research team was increased, along with response bias (acquiescence bias and social desirability bias).

Chapter 5: Results

5.1 Introduction

This chapter presents the results of the research propositions as highlighted in Chapter 3. The design of this chapter is in line with the objective of the research and uses the techniques explained in the methodology section in Chapter 4. The objective of this research was to identify the factors which influence mobile data adoption at the BoP. The first section of this chapter outlines the characteristics and descriptive statistics of the sample which was used to answer the research questions. Cronbach's Alpha and factor analysis were used to evaluate the reliability of the questionnaire output. Correlation analysis and ANOVA were utilised to assess if there was any relationship between the variables, then linear regression was performed to identify the important factors for mobile data adoption and to rank the different factors.

5.2 Response rate

A total of 421 responses were received from the questionnaire administered by the field survey team. Of the total number of responses, 15 were not fully completed and were excluded from the study, leaving 406 responses. The fully completed responses of 406 exceeded the requirement of 384 respondents for the study.

5.3 Descriptive statistics

The mobile data usage variable was measured by calculating the average of all mobile data usage services measured by the questionnaire (WhatsApp, Ringtones, Browse, Email, Video and Games) which are outlined in Table 1. From the questionnaire the highest frequency of use to the lowest frequency of use were coded and mean scores calculated. From the coding, this implied that the higher the mean in the data usage analysis, the higher the usage of mobile data.

Table 1: Mobile data usage

Mobile Data Service	Data Usage
WhatsApp	5.3
Ringtones	2.2
Browse	4.7
Email	3.9
Videos	2.8
Games	2

Table 1 indicates that WhatsApp and Browse are the main contributors to data usage for the respondents.

5.3.1 Characteristics of the sample

The questionnaire was completed by 406 respondents. The sample was drawn from the township of Diepsloot and based on non-probability, quota sampling.

The demographics of the respondents are outlined in Figure 11 and Figure 12.

Figure 11: Gender

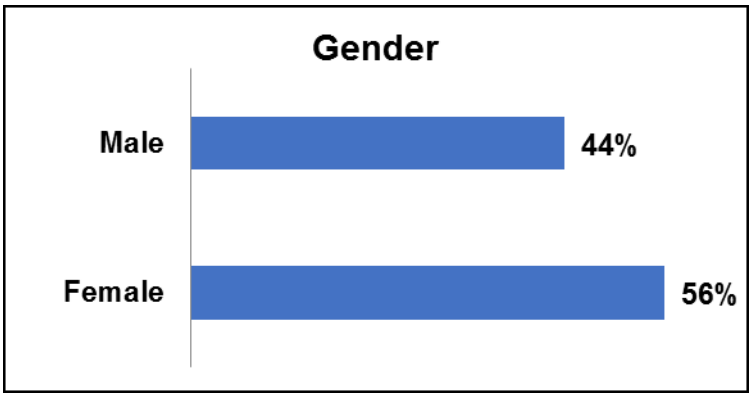


Table 2: Gender data usage mean

Gender	Data Usage Average
Male	3.5
Female	3.4

Figure 11 shows that 56% (n=227) of the respondents were female. Noting the data usage means explained in section 5.3, the higher the mean, the higher the mobile data usage by the group. Table 2 thus indicates that the average data usage for male respondents is slightly more than for female respondents.

Figure 12: Age group

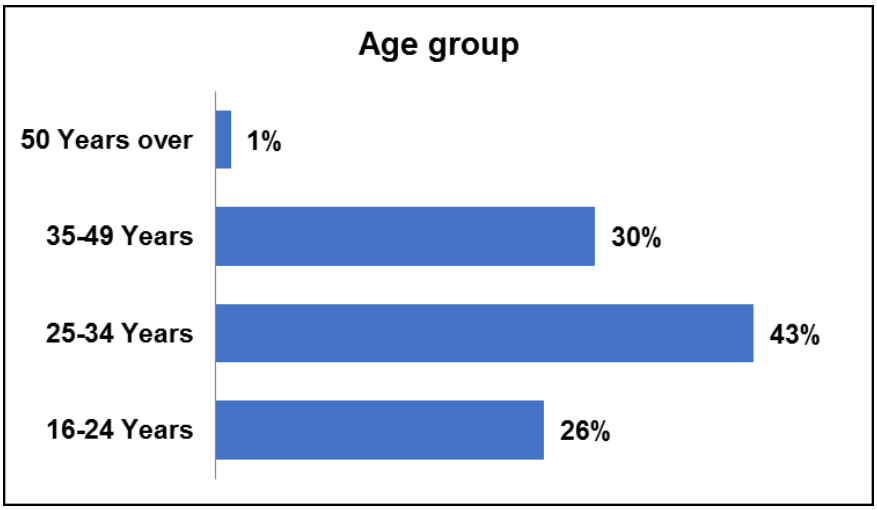


Table 3: Age group data usage mean

Age Group	Data Usage Average
50 Over	3
35 - 49	3.4
25 - 34	3.5
16 - 24	3.4

Figure 12 shows that the age group between 25 and 34 years had the most respondents (43%, n=173), with 69% (n=278) being below the age of 35. The respondents aged between 25 and 34 years had the highest data usage. Respondents in the age group of over 50 years had the lowest data usage.

Figure 13: Income group

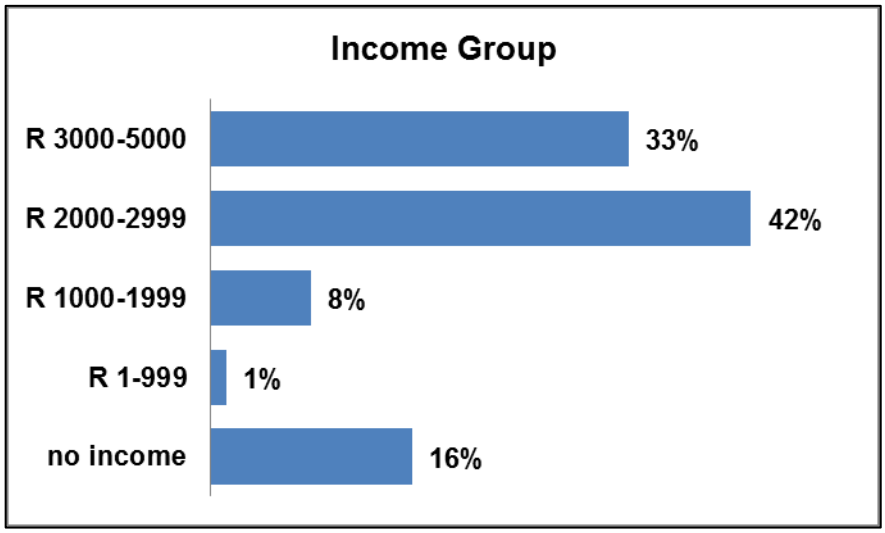


Table 4: Income group data usage mean

Income Group	Data Usage Average
R3 000 - R5 000	3.4
R2 000 – R2 999	3.6
R1 000 – R1 999	3.6
R 1 – R 999	3.7
No income	3.1

Figure 13 shows that the highest percentage of respondents had an income of between R2000 and R2999 (42%, n=172). Respondents with no income had the lowest data usage. Excluding the no income group, it is evident from the data usage distribution that the lower the income grouping, the more mobile data a respondent uses.

Figure 14: No income group age breakdown

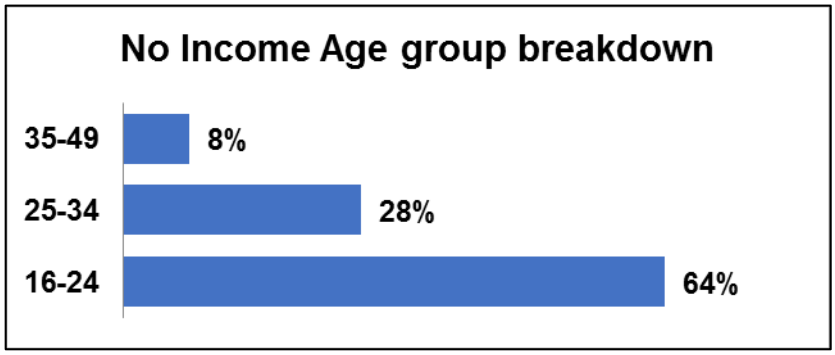


Table 5: No income group data usage mean

Age Group	Data Usage Average
35 - 49	2.4
25 - 34	3
16 - 24	3.2

Figure 14 shows that 64% (n=41) of the respondents with no income were in the age group between 16 and 24 years. The respondents between the age of 16 and 24 had the highest data usage with a mean of 3.2.

Figure 15: Prepaid or contract

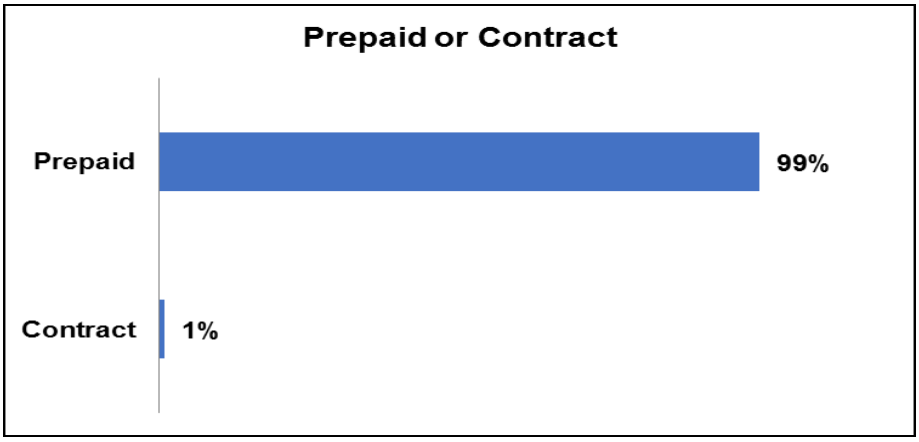


Table 6: Prepaid and contract data usage mean

Prepaid or Contract	Data Usage Average
Prepaid	3.5
Contract	4

Figure 15 shows that 99% (n=402) of the respondents used prepaid phones, with 1% (n=4) using contract mobile services. The contract respondent's usage of data was higher than that of the prepaid respondents.

Figure 16: Mobile network operator

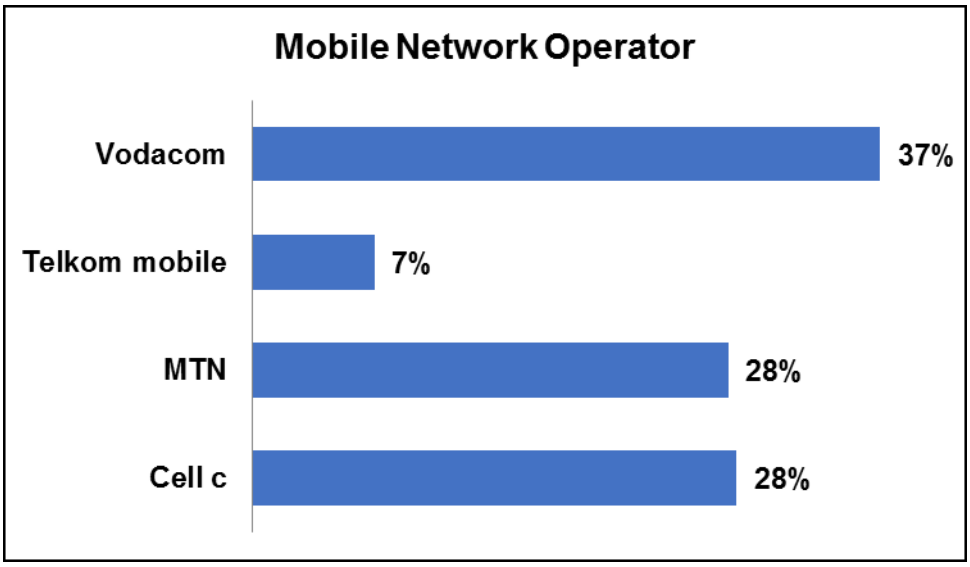


Table 7: Network operator group data usage mean

Network	Data Usage Average
Vodacom	3.5
Telkom mobile	3.6
MTN	3.3
Cell C	3.6

Figure 16 shows that there were more Vodacom respondents (37%, n=149) than any other network. Cell C and Telkom mobile had the highest data usage, with MTN having the lowest.

Figure 17: Smartphone ownership

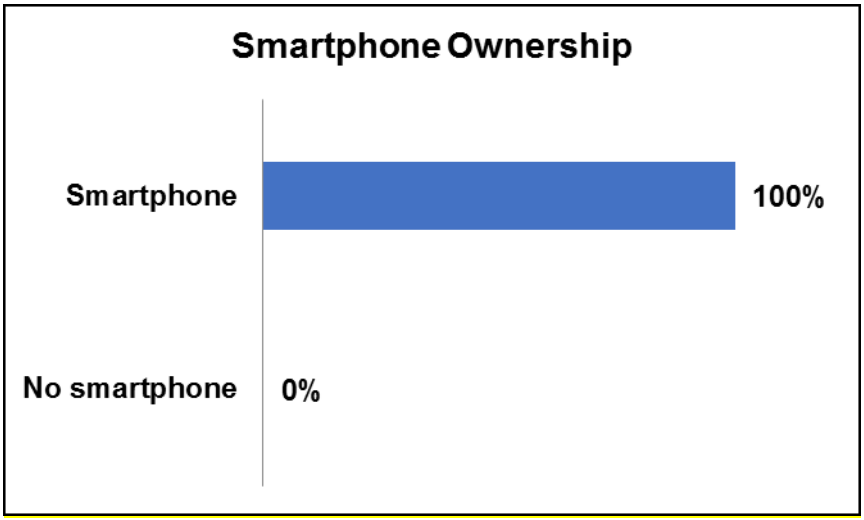


Figure 17 indicates that nearly all respondents had a smartphone (only one respondent did not).

Figure 18: Phone make

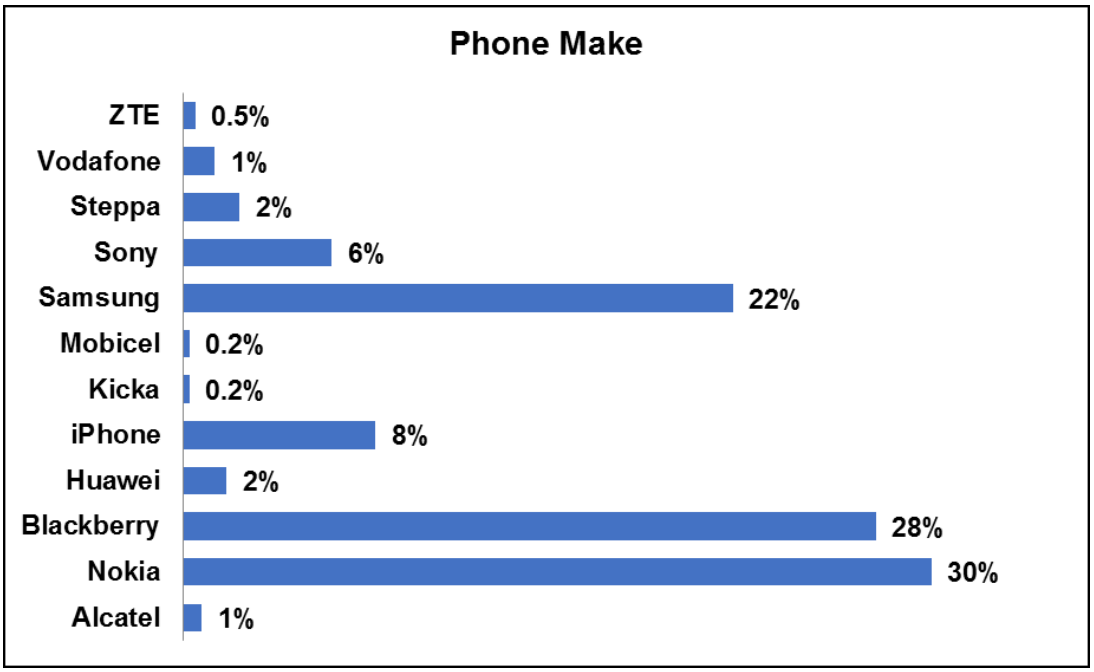


Table 8: Phone make group data usage mean

Phone Make	Data Usage Average
ZTE	3.3
Vodafone	3.4
Steppa	2.9
Sony	3.1
Samsung	3.3
Nokia	3.1
Mobicel	3
Kicka	2.7
iPhone	3.3
Huawei	2.9
Blackberry	4.2
Alcatel	3.2

Figure 18 indicates that a high number of respondents used Blackberry, Nokia, Samsung, iPhone and Sony cell phones. The Blackberry and Vodafone respondents had the highest usage of mobile data with means of 4.2 and 3.4 respectively.

Figure 19: SMS usage

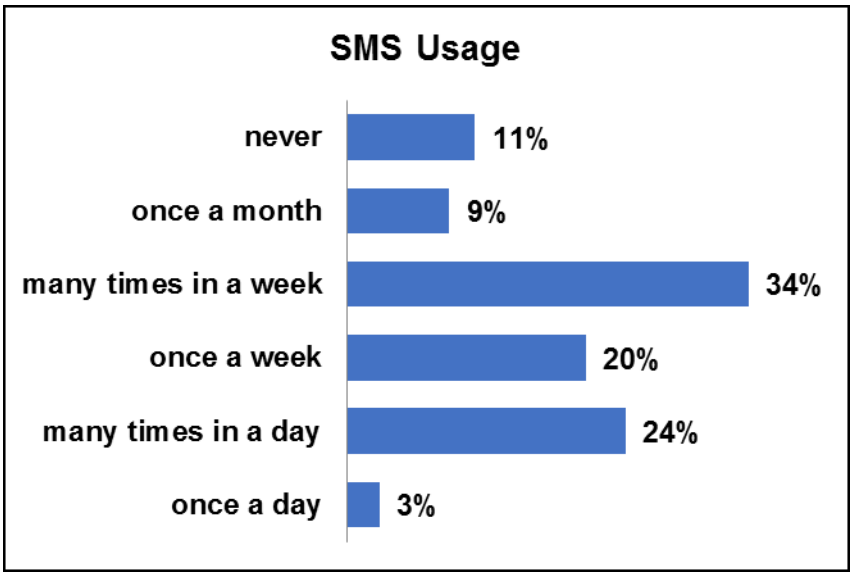


Figure 19 shows that 34% (n=138) of the respondents used the SMS tool many times in a week.

Figure 20: mBanking usage

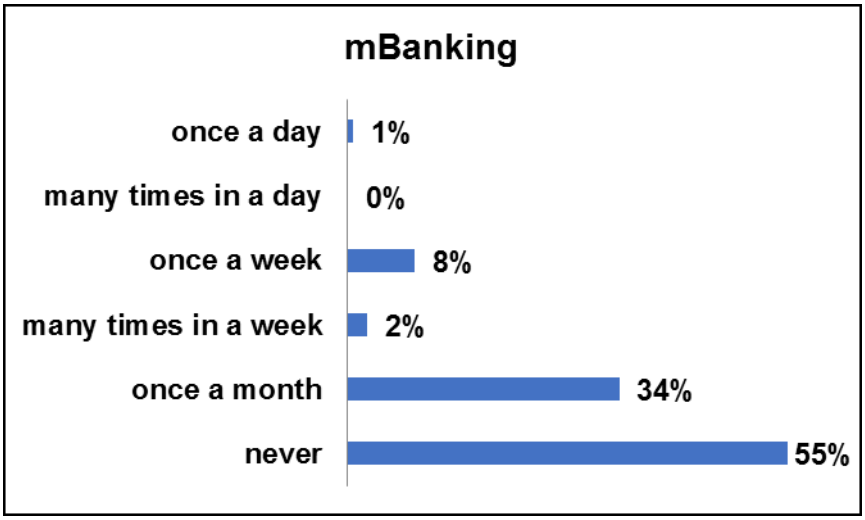


Table 9: mBanking data usage mean

mBanking Usage	Data Usage Average
Never	3.4
Once a month	3.5
Many times in a week	3.3
Once a week	3.5
Many times in a day	-
Once a day	4.6

Figure 20 shows that most respondents did not use mobile banking applications. Respondents who used the mBanking applications once a day had a high usage of data.

Table 10: Money spent on airtime/data

Average spend on airtime/data		
Female	R	58.02
Male	R	71.14
Average Individual Spend per week	R	63.80
Average Individual Spend per month	**R**	**255.21**

Table 10 above highlights the average amount of money spent on airtime and mobile data by the respondents. Female consumption of airtime and data was R58.02 per week, with males spending R71.14 a week on mobile services. The average spend per individual per month was R255.21.

Table 11: Monthly spend by income group

Income Group	Monthly Spend		% of Monthly Income
R 1-999	**R**	**237.60**	**24%**
R 1000-1999	**R**	**265.25**	**13%**
R 2000-2999	**R**	**240.42**	**8%**
R 3000-5000	**R**	**303.13**	**6%**
No income	**R**	**191.75**	**-**

Table 11 above highlights the average amount of money spent on airtime and mobile data by the various income groups.

Figure 21: Frequency of purchase of airtime/data vouchers

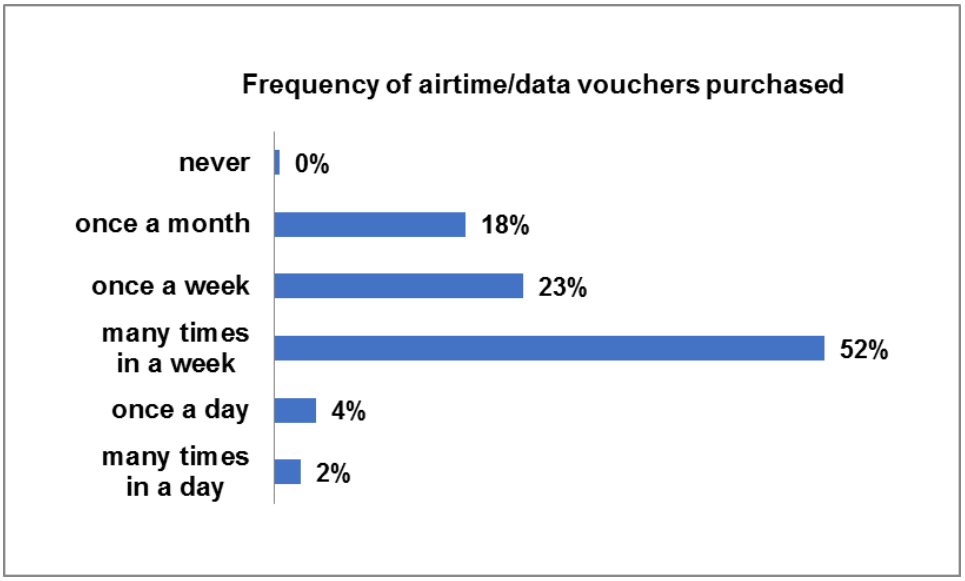


Figure 21 indicates that more than 70% of respondents purchased airtime and data vouchers at least once week, with 52% of them purchasing vouchers many times within the week.

5.3.2 Construct and scale items' total scores

This section reveals the results of the mean, mode, standard deviation, skewness and kurtosis of the individual questions in Table 12. The table includes all 18 questions, which are categorised into the seven factors, namely Perceived Usefulness, Perceived Ease of Use, Subjective Norm, Awareness, Affordability, Acceptability and Availability.

Table 12: Descriptive statistics for all factors

Factor	Code	Scale	Mean	Std Dev	Variance	Mode	Range	Skewness	Kurtosis	Total Mean
Perceived Usefulness	Q19 - PU1	Cellphone applications like WhatsApp, BBM, Google, Facebook makes it easy for me to do my job	3.88	0.83	0.69	4.00	4.00	-0.66	0.59	3.97
	Q20 - PU2	Using the internet on my cellphone helps me get daily information like news weather , sports results like Soccer scores	3.97	0.77	0.59	4.00	4.00	-0.84	1.42	
	Q21 - PU3	Using cellphone applications like WhatsApp, Facebook, Google etc. makes my life easier and convenient	4.06	0.74	0.55	4.00	4.00	-0.65	1.10	
Perceived Ease Of Use	Q22 - PEOU1	It is easy to use cellphone internet and applications on my phone	4.04	0.67	0.45	4.00	4.00	-0.86	2.28	3.82
	Q23 - PEOU2	Cellphone applications like WhatsApp, Facebook, News24 etc. are easy to install on my phone	3.99	0.84	0.71	4.00	4.00	-1.11	1.85	
	Q24 - PEOU3	Connecting to cellphone internet and data services is long and difficult	3.43	1.00	1.01	4.00	4.00	-0.58	-0.20	
Subjective Norm	Q25 - SN1	I use cellphone internet and mobile data applications because my friends use it as well.	3.50	1.24	1.53	4.00	4.00	-0.79	-0.31	3.29
	Q26 - SN2	Using cellphone applications like Facebook, Email, WhatsApp makes me feel important amongst my friends and family	2.87	1.22	1.48	2.00	4.00	0.21	-1.07	
	Q27 - SN3	My friends and family introduced (showed) me cellphone data applications	3.51	1.06	1.12	4.00	4.00	-0.77	-0.19	
Awareness	Q28 - AW1	I know about most of the cellphone data applications.	3.35	1.01	1.03	4.00	4.00	-0.43	-0.90	3.56
	Q29 - AW2	I receive information , updates and adverts on all new cellphone applications and its use	3.87	0.72	0.52	4.00	4.00	-1.70	3.59	
	Q30 - AW3	My friends and family tell me or show me any new cellphone applications	3.47	0.91	0.83	4.00	4.00	-0.64	-0.33	
Affordability	Q31 - AF1	I understand the cost and pricing plans for cellphone data services	3.43	0.95	0.90	4.00	4.00	-0.52	-0.37	3.31
	Q32 - AF2	I purchase data bundles/vouchers for my cellphone once a week	3.19	1.40	1.97	4.00	5.00	-0.44	-1.26	
Acceptability	Q33 - AC1	I like cellphone data services such as the internet , Facebook, WhatsApp etc. because my friends and family also use it.	3.44	1.17	1.38	4.00	4.00	-0.84	-0.19	3.09
	Q34 - AC2	I trust cellphone data applications like Facebook, WhatsApp on my cellphone	2.74	1.13	1.28	3.00	4.00	-0.20	-1.12	
Availability	Q35 - AV1	I have good cellphone signal for cellphone data services like Facebook, WhatsApp etc. in my area	3.84	0.87	0.76	4.00	4.00	-1.01	0.93	4.13
	Q36 - AV2	I can buy cellphone data vouchers/bundles anywhere in my area	4.42	0.56	0.31	4.00	4.00	-0.39	0.90	

The table above shows that Availability had the highest average mean of 4.13. The table also shows that Perceived Usefulness, Perceived Ease of Use and Availability were the three factors which had questions or items with a mean of more than 4. The questions with more than a mean of 4 were the following:

- Q21 - "Using cell phone applications like WhatsApp, Facebook, Google etc. makes my life easier and convenient".
- Q22 - "It is easy to use cell phone internet and applications on my phone".

- Q36 - “I can buy cell phone data vouchers/bundles anywhere in my area”.

The questions with less than a mean of 3 were the following:

- Q26 - “Using cell phone applications like Facebook, Email, WhatsApp makes me feel important amongst my friends and family”.
- Q27 - “I trust cell phone data applications like Facebook, WhatsApp on my cell phone”.

The table also shows that the majority of the questions were negatively skewed for all factors, which shows the relationship between all the questions. Subjective Norm questions had the highest variance, with Availability having the lowest. Question 36 - “I can buy cell phone data vouchers/bundles anywhere in my area” - had the highest mean and also had the lowest variance. Question 24 - “Connecting to cell phone internet and data services is long and difficult” - and Question 26 - “Using cell phone applications like Facebook, Email, WhatsApp makes me feel important amongst my friends and family” - had the lowest mode of 2.

The majority of the questions had a kurtosis of less than 3, which means that the distribution had a wider peak, with only Question 29 - “I receive information , updates and adverts on all new cell phone applications and its use” - having a kurtosis higher than 3.

5.3.3 Summary of descriptive statistics

The mobile data usage variable contained six services, with WhatsApp being the service which contributed the most to data usage. Most of the respondents had the following characteristics:

- Female
- Aged between 25 and 34 years
- Income group between R2000 and R2999
- Utilised the Vodacom network
- Handset choice of Nokia, Blackberry, Samsung or Sony.

The respondents who used the Blackberry, Cell C and Telkom networks and the contract respondents consumed the most mobile data.

From the descriptive statistics, the factors which impact the adoption of mobile data the most are Perceived Usefulness, Perceived Ease of Use and Availability. The factor that has the least impact on the usage of mobile data is Subjective Norm.

5.4 Reliability analysis

5.4.1 Reliability

Reliability is an important feature of data analysis because it measures the strength of the results and the degree to which the data collection method would yield consistent results (Cooper & Schindler, 2013).

This section will use Cronbach's Alpha to measure the level of reliability. A Cronbach's Alpha of less than 0.5 means that the result's reliability is weak, an Alpha between 0.5 and 0.6 means that the result's reliability is poor, between 0.6 and 0.7 means the result's reliability is acceptable, between 0.8 and 0.9 means that the result's reliability is good, and greater than 0.9 means the result's reliability is excellent.

Table 13: Reliability results

Factors	Cronbach's Alpha	Acceptable level
Perceived Usefulness	0.77	Acceptable
Perceived Ease Of Use	0.52	Poor
Subjective Norm	0.78	Acceptable
Awareness	0.15	Weak
Affordability	-0.12	Weak
Acceptability	0.51	Poor
Availability	0.35	Weak

Table 13 shows that Perceived Usefulness and Subjective Norm were the only factors with an acceptable level of reliability using the Cronbach's Alpha. Perceived Ease of Use and Acceptability had a poor reliability level with the other factors being weak.

5.4.2 Factor analysis

Factor analysis clusters factors into homogenous sets and utilises correlations and variability of factors to cluster the factors. Table 14 below shows the clustering of the factors.

The factor analysis table will cluster the different questions of the questionnaire into factors. If questions in a construct fall in one factor, it means that the answering of the question and what the questions are measuring are similar.

Table 14: Factor analysis clusters

		Factor Pattern					
Factors	**Code**	**Factor1**	**Factor2**	**Factor3**	**Factor4**	**Factor5**	**Factor6**
Perceived Usefulness	Q19 - PU1	0.26293	0.62409	-0.35249	-0.07846	-0.06982	-0.10296
	Q20 - PU2	0.31208	0.61615	-0.4082	-0.12744	-0.1657	-0.02051
	Q21 - PU3	0.3486	0.63921	-0.41524	0.00674	-0.0906	0.04287
Perceived ease of Use	Q22 - PEOU1	0.37255	0.22472	0.26301	0.58331	-0.15236	0.24636
	Q23 - PEOU2	0.34813	0.36863	0.15144	0.57104	-0.12707	0.17697
	Q24 - PEOU3	0.00764	-0.17062	0.00839	0.67718	-0.16261	-0.1172
Subjective Norm	Q25 - SN1	0.77211	-0.25083	-0.09465	0.04881	0.22448	-0.00483
	Q26 - SN2	0.76523	-0.06279	0.19303	-0.21081	0.13005	-0.0347
	Q27 - SN3	0.75631	-0.24789	0.1161	-0.11114	-0.22939	-0.05926
Awareness	Q28 - AW1	-0.14201	0.50051	0.37136	0.03104	0.52939	-0.04488
	Q29 - AW2	0.25769	0.27385	0.42435	-0.07598	-0.02765	-0.2305
	Q30 - AW3	0.62711	-0.28109	0.17706	-0.19306	-0.23866	-0.26584
Affordability	Q31 - AF1	0.10451	0.32466	0.18626	0.10683	0.6471	-0.22964
	Q32 - AF2	0.14966	-0.21315	-0.2084	-0.14025	0.25247	0.72658
Acceptability	Q33 - AC1	0.76376	-0.36343	-0.15678	0.06304	0.19761	-0.03947
	Q34 - AC2	0.30735	-0.10971	-0.44601	0.172	0.3835	-0.02855
Availability	Q35 - AV1	0.22782	0.09816	0.50181	-0.20733	-0.03642	0.40894
	Q36 - AV2	0.17506	0.58794	0.2181	-0.311	-0.16797	0.12498

Perceived Usefulness and Subjective Norm were the only factors that the researcher's sets and the sets from the factor analysis had the same, with the other factors being different. This is in line with the results of the Cronbach's Alpha.

5.4.3 Reliability summary

The Cronbach's Alpha shows that only Perceived Usefulness and Subjective Norm had an acceptable level of reliability. The factor analysis confirmed the Cronbach's Alpha results by concluding that only the Perceived Usefulness and Subjective Norm answering of questions were clustered under one factor, with the other construct's questions not being clustered in one factor.

5.5 Analysis of the relationship of the factors

The Pearson correlation analysis and the ANOVA test were used to study the relationship of the different constructs. The Pearson correlation was used to check if there was a link between the different constructs and the ANOVA test was used to check if the different constructs were independent from each other.

5.5.1 Pearson correlation analysis for the factors

The Pearson correlation was used to specify the relationships between the factors. A 5% level of significance was used. Table 15 shows the results of the correlation matrix.

Table 15: Pearson correlation coefficients of dimension

Item		Perceived Usefulness	Perceived ease of use	Subjective Norm	Awareness	Affordability	Acceptability	Availability
Perceived Usefulness	Correlation Value	1	0.10601	0.1291	0.1375	0.04898	0.11015	0.16589
	P-value		0.0332	0.0094	0.0056	0.3261	0.0268	0.0008
Perceived ease of use	Correlation Value		1	0.14955	0.08038	-0.01942	0.12319	0.0382
	P-value			0.0025	0.1058	0.6964	0.013	0.4427
Subjective Norm	Correlation Value			1	0.3098	0.14991	0.56772	0.1753
	P-value				<.0001	0.0025	<.0001	0.0004
Awareness	Correlation Value				1	0.07188	0.04439	0.26162
	P-value					0.1482	0.3724	<.0001
Affordability	Correlation Value					1	0.18535	0.04645
	P-value						0.0002	0.3506
Acceptability	Correlation Value						1	-0.07589
	P-value							0.1269
Availability	Correlation Value							1
	P-value							

Table 15 above displays the results of the test of correlation between the different factors. A p-value of less than 0.05 led to the acceptance of the proposition and a conclusion that there was a significant relationship. A p-value of less than 0.01 meant a highly significant relationship.

The following pairs of factors had a p-value greater than 0.05, which meant that these two factors were not strongly correlated:

- Perceived Usefulness and Affordability
- Perceived Ease of Use and Awareness
- Perceived Ease of Use and Affordability
- Perceived Ease of Use and Availability
- Awareness and Affordability
- Awareness and Acceptability
- Affordability and Availability
- Acceptability and Availability

All the other remaining combination of pairs of factors as highlighted in the above table had a p-value significantly lower than 0.05, which meant that these pair factors were strongly correlated.

5.5.2 ANOVA results

ANOVA analysed the difference or independence of different groups. If the p-value of the ANOVA test was less than 0.05, then it could be concluded that the seven factors were independent and different.

Table 16: ANOVA analysis

Analysis of Variance					
Source	**DF**	**Sum of Squares**	**Mean Square**	**F Value**	**Pr > F**
Model	7	134.59182	19.2274	23.97	<.0001
Error	396	317.67462	0.80221		
Corrected Total	403	452.26643			

Table 16 above displays the ANOVA results and reveals a p-value of less than 0.005, indicating that the seven factors were different and independent from each other.

5.5.3 Analysis of the relationship of the factor summary

The analysis for the relationship of the seven factors shows that all the factors were correlated except for Accessibility and Availability. The analysis also showed that the seven factors were independent and different.

5.6 Regression analysis

A regression analysis assumes that the independent variables are normally distributed. This section tested for normality of all the independent variables using histogram, Q-Q plot, Kolmogorov-Smirnov test, Cramer-von Mises criterion and the Anderson-Darling test. A Plots Analysis was performed and in order for the data to be approximately normally distributed, the following criteria had to be met:

- Histogram plots must be bell-shaped.
- The estimated and observed values must be approximately linearly related and form a straight line.

If the above criteria are not met, then the data is not closely normally distributed.

Testing for normality was conducted and if the p-values for the Kolmogorov-Smirnov, Cramer-von Mises and the Anderson-Darling tests were less than 0.05, then the data was approximately normally distributed and had a specific distribution.

5.6.1 Perceived Usefulness

Plots to test for normality:

Figure 22: Perceived Usefulness histogram

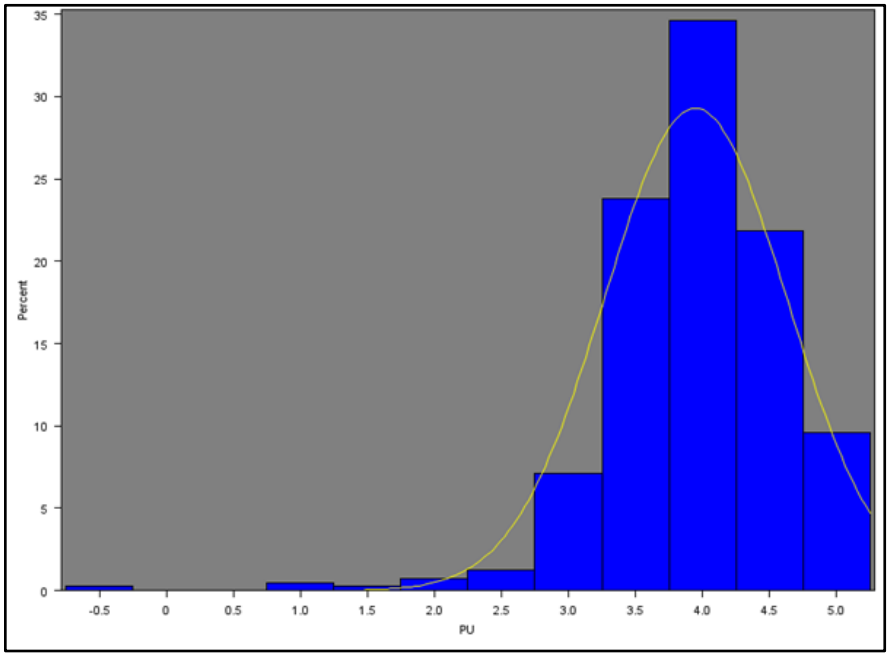


Figure 22 shows that Perceived Usefulness was approximately normally distributed since the data indicates a bell-like shape.

Figure 23: Perceived Usefulness Q-Q plot

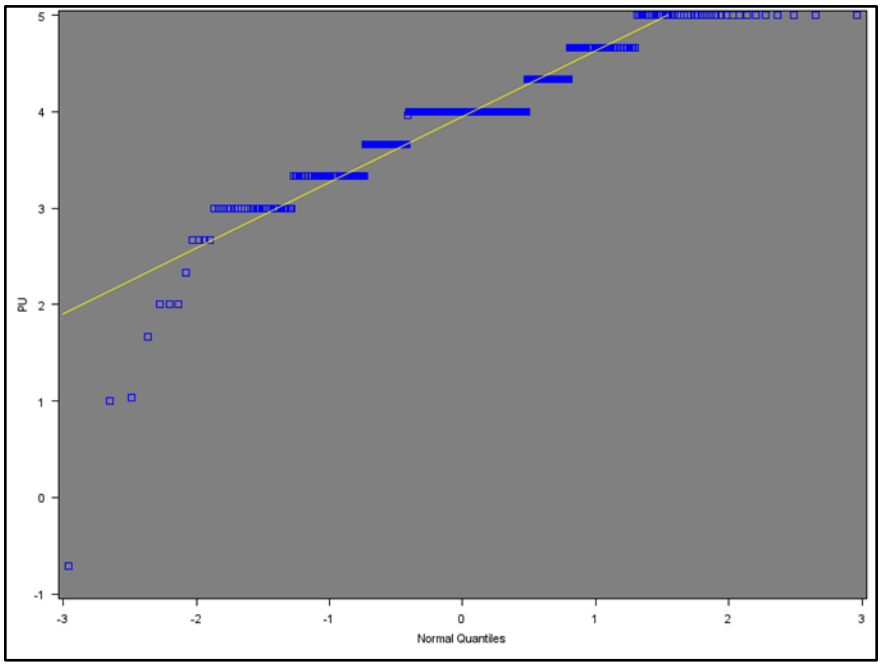


Figure 23 shows that the combination of the estimated values and the actual values are linearly related and form a straight line. This shows that the Perceived Usefulness observations are approximately normally distributed. The factor had four outliers.

Tests for normality:

Table 17: Goodness-of-Fit Tests for Normal Distribution

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	D	0.188255	Pr > D	<0.010
Cramer-von Mises	W-Sq	1.882308	Pr > W-Sq	<0.005
Anderson-Darling	A-Sq	9.548676	Pr > A-Sq	<0.005

Table 17 shows that all the normality tests used resulted in a p-value which was less than 0.05, which means that Perceived Usefulness has a specific distribution and was approximately normally distributed.

5.6.2 Perceived Ease of Use

Plots to test for normality:

Figure 24: Perceived Ease of Use histogram

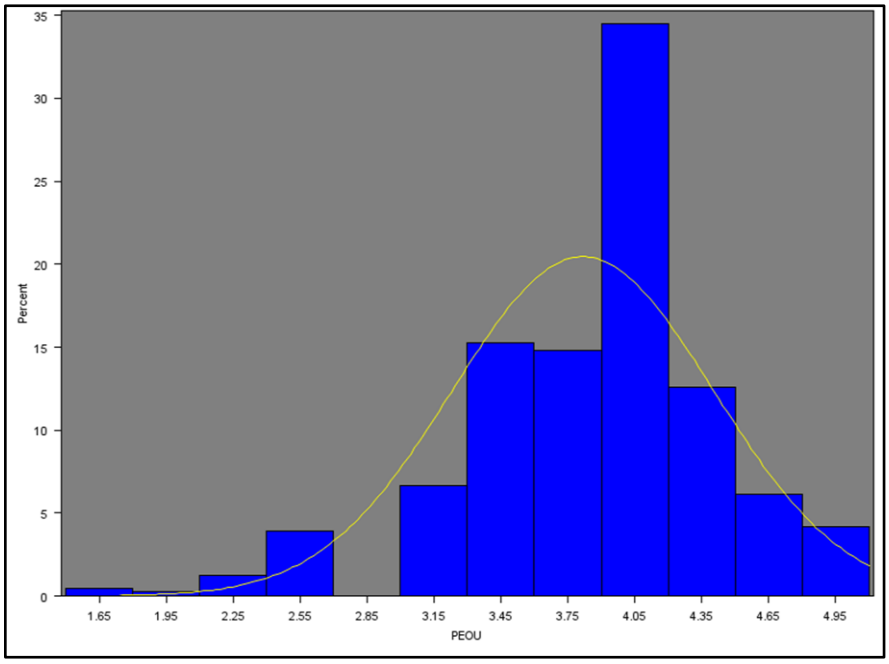


Figure 24 shows that Perceived Ease of Use is approximately normally distributed because it has a bell-like shape.

Figure 25: Perceived Ease of Use Q-Q plot

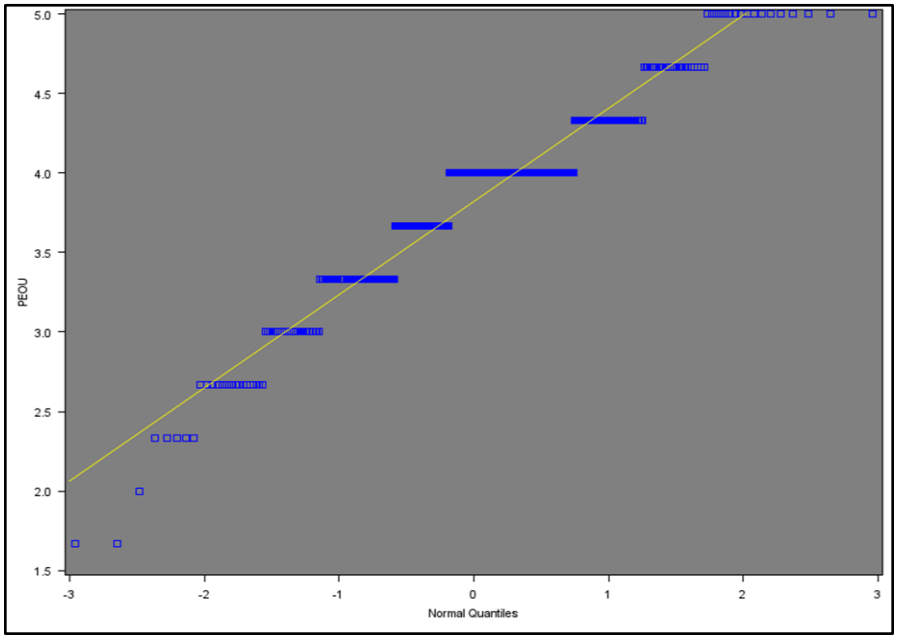


Figure 25 shows that the combination of the estimated values and the actual values are linearly related and they form a straight line. This shows that Perceived Ease of Use observations are approximately normally distributed. The factor had two outliers.

Tests for normality:

Table 18: Goodness-of-Fit Tests for Normal Distribution

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	D	0.19614942	Pr > D	<0.010
Cramer-von Mises	W-Sq	1.9462711	Pr > W-Sq	<0.005
Anderson-Darling	A-Sq	9.32209016	Pr > A-Sq	<0.005

Table 18 shows that all the normality tests used resulted in a p-value which was less than 0.05, which means that the Perceived Ease of Use has a specific distribution and was approximately normally distributed.

5.6.3 Subjective Norm

Plots to test normality:

Figure 26: Subjective norm histogram

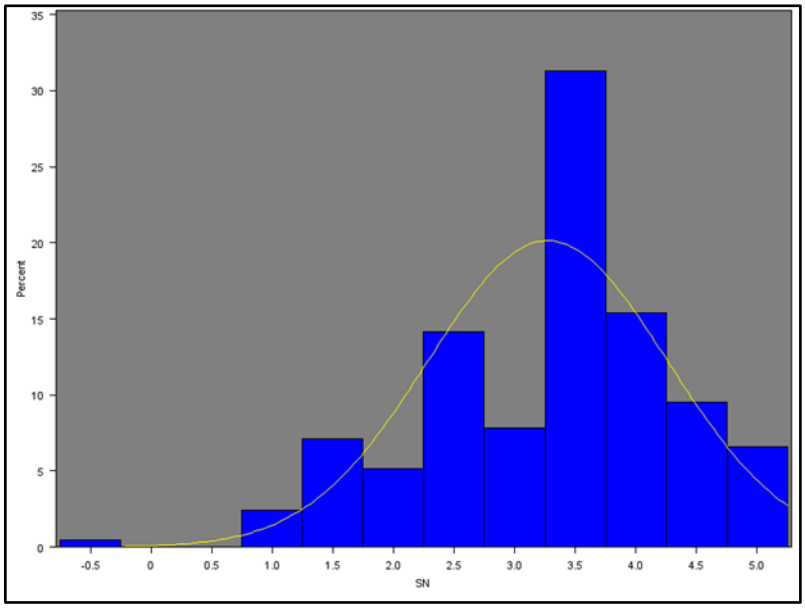


Figure 26 shows that Subjective Norm is approximately normally distributed because it has a bell-like shape.

Figure 27: Subjective norm Q-Q plot

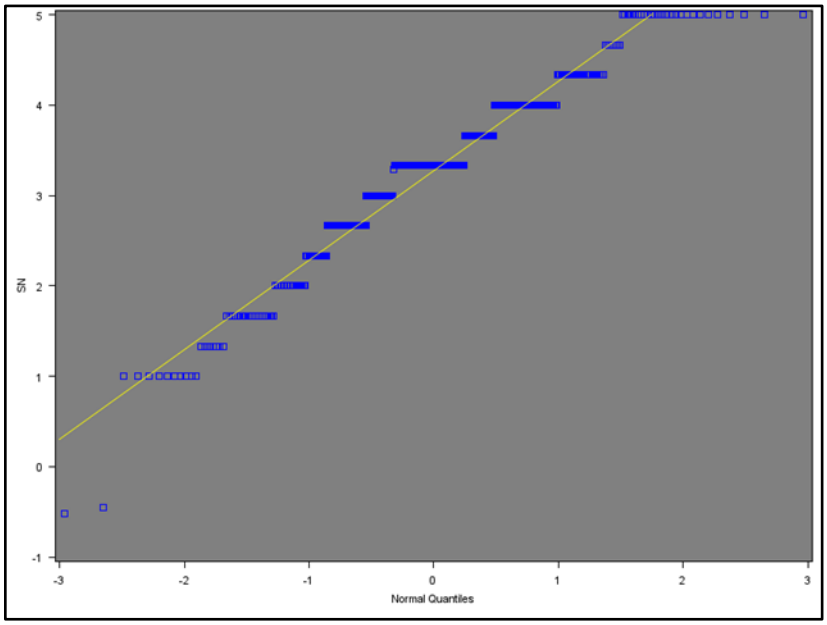


Figure 27 shows that the combination of the estimated values and the actual values are linearly related and they form a straight line. This shows that the Subjective Norm observations are approximately normally distributed. The factor had two outliers.

Tests for normality:

Table 19: Goodness-of-Fit Tests for Normal Distribution

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	D	0.149881	Pr > D	<0.0100
Cramer-von Mises	W-Sq	0.948053	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	5.060423	Pr > A-Sq	<0.0050

Table 19 shows that all the normality tests used resulted in a p-value which is less than 0.05, which means that Subjective Norm has a specific distribution and was approximately normally distributed.

5.6.4 Awareness

Plots to test normality:

Figure 28: Awareness histogram

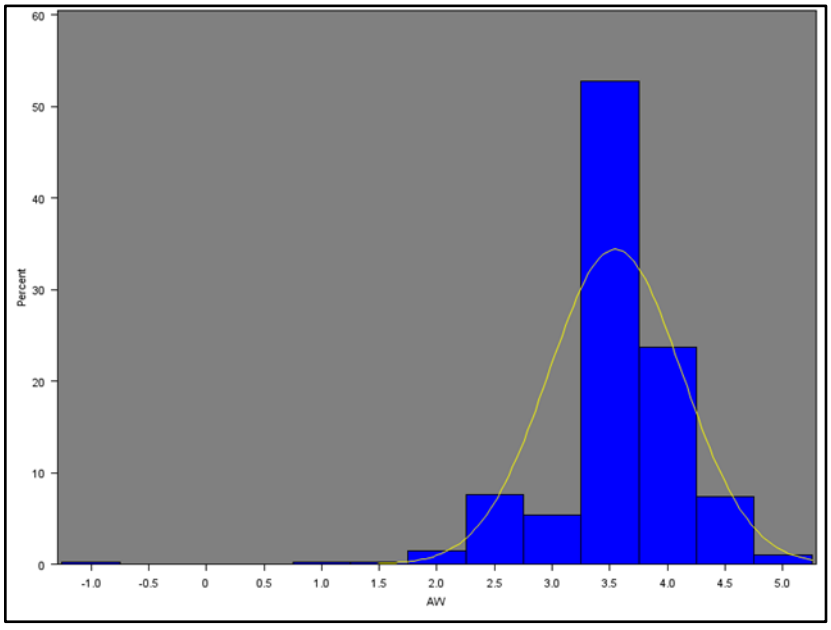


Figure 28 shows that Awareness is approximately normally distributed because it has a bell-like shape.

Figure 29: Awareness Q-Q plot

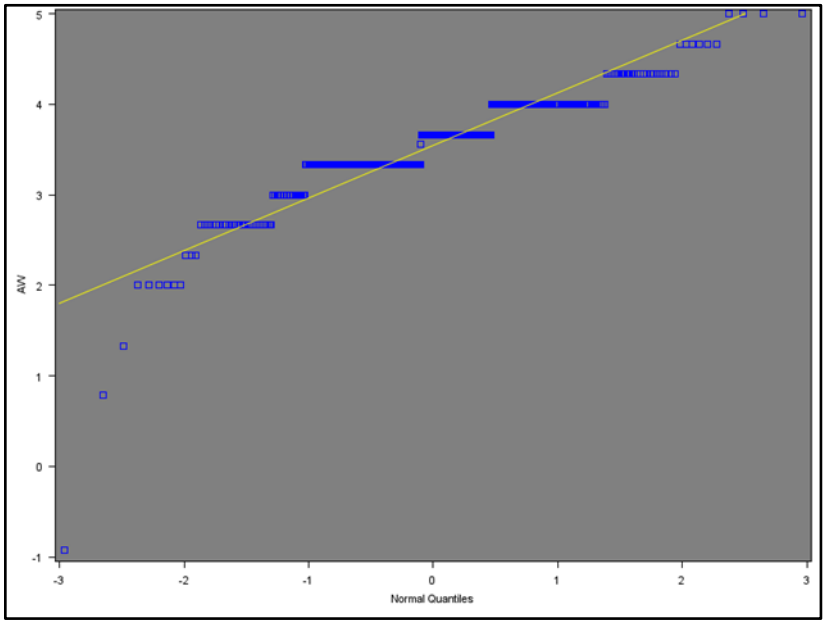


Figure 29 shows that the combination of the estimated values and the actual values are linearly related and they form a straight line. This shows that the Awareness observations are approximately normally distributed. The factor had three outliers.

Tests for normality:

Table 20: Goodness-of-Fit Tests for Normal Distribution

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	D	0.204651	Pr > D	<0.0100
Cramer-von Mises	W-Sq	2.265493	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	12.2637	Pr > A-Sq	<0.0050

Table 20 shows that all the normality tests used resulted in a p-value which is less than 0.05, which means that Awareness has a specific distribution and was approximately normally distributed.

5.6.5 Affordability

Plots to test normality:

Figure 30: Affordability histogram

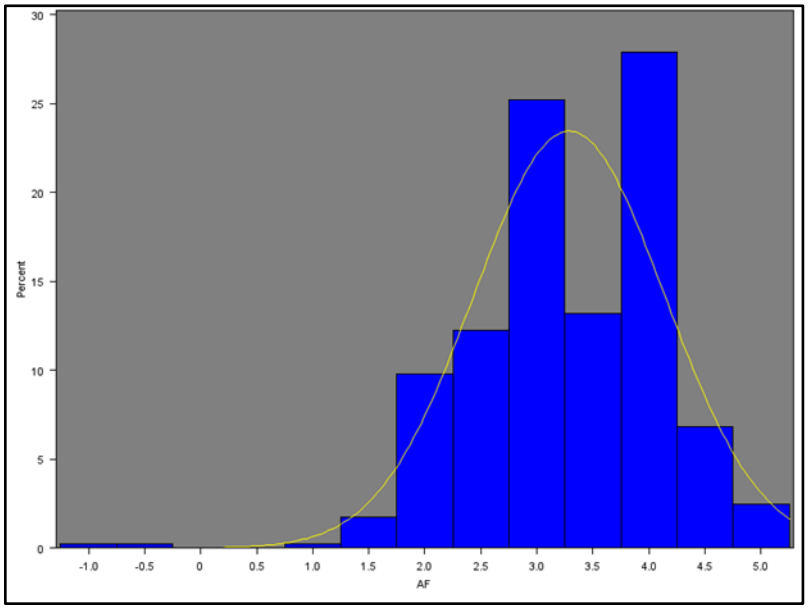


Figure 30 shows that Affordability is approximately normally distributed because it has a bell-like shape.

Figure 31: Affordability Q-Q plot

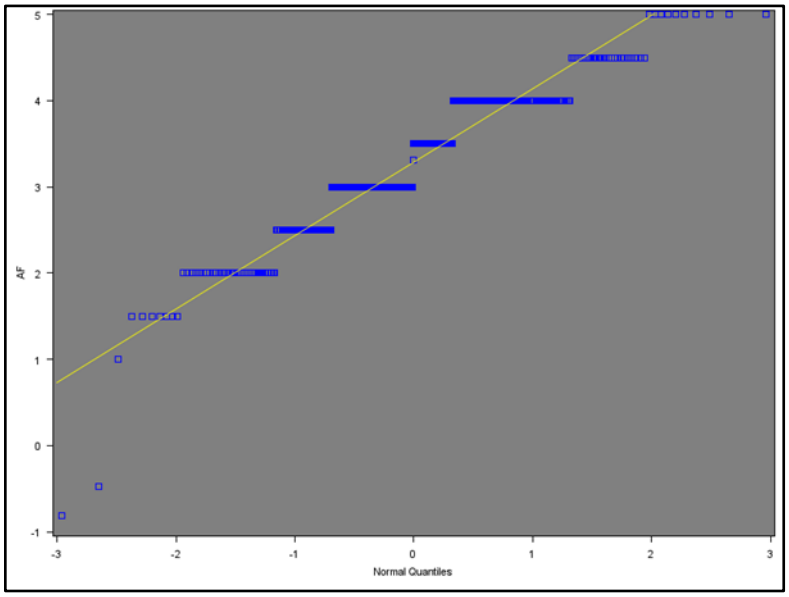


Figure 31 shows that the combination of the estimated values and the actual values are linearly related and they form a straight line. This shows that the Affordability observations are approximately normally distributed. The factor had two outliers.

Tests for normality:

Table 21: Goodness-of-Fit Tests for Normal Distribution

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	D	0.170185	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.650776	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	9.339055	Pr > A-Sq	<0.0050

Table 21 shows that all the normality tests used resulted in a p-value which is less than 0.05, which means that Affordability has a specific distribution and was approximately normally distributed.

5.6.6 Acceptability

Plots to test normality:

Figure 32: Acceptability histogram

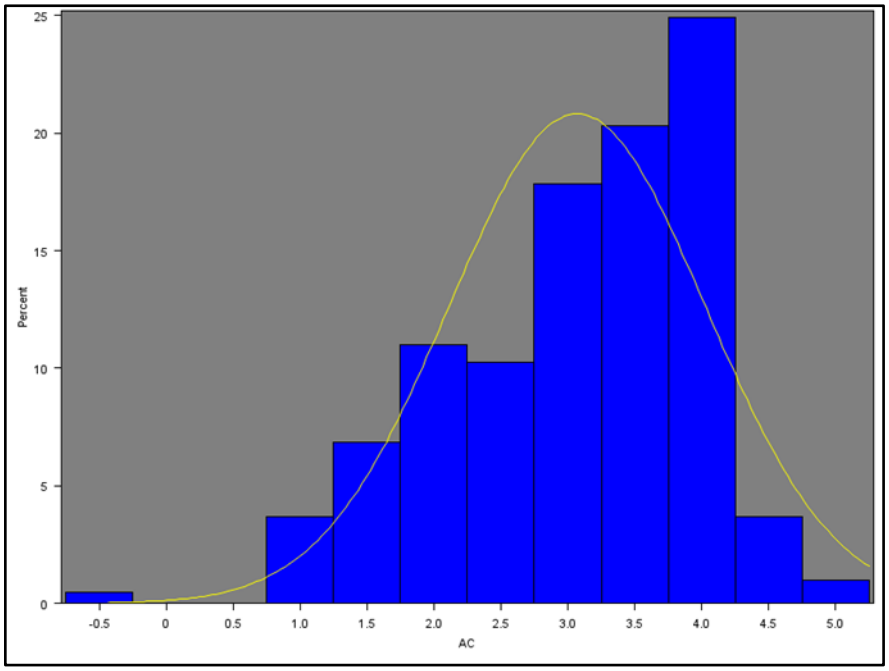


Figure 32 shows that Affordability is approximately normally distributed because it has a bell-like shape, but is also slightly skewed to the right.

Figure 33: Acceptability Q-Q plot

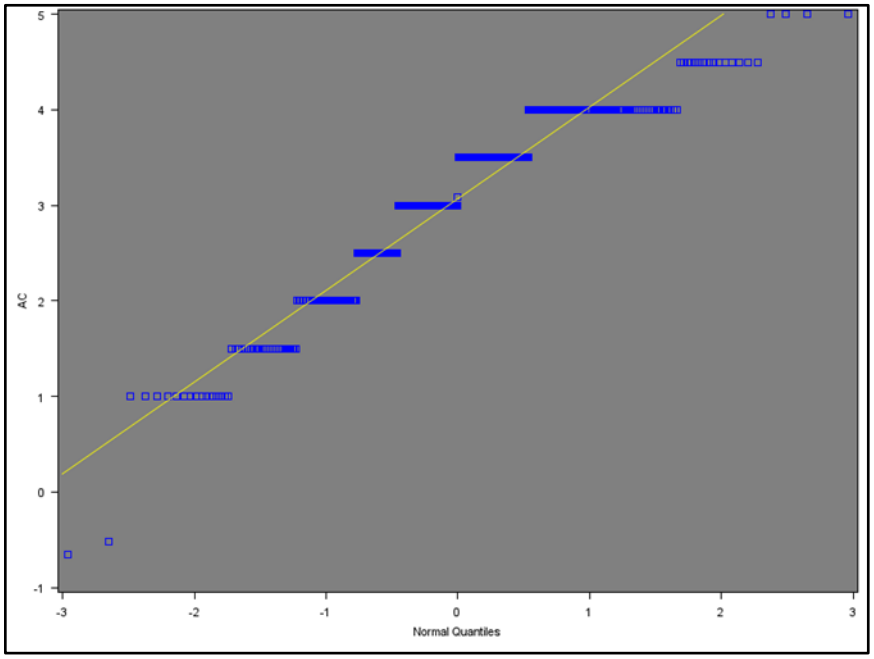


Figure 33 shows that the combination of the estimated values and the actual values are linearly related and they form a straight line. This shows that the Acceptability observations are approximately normally distributed. The factor had two outliers.

Tests for normality:

Table 22: Goodness-of-Fit Tests for Normal Distribution

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	D	0.171691	Pr > D	<0.0100
Cramer-von Mises	W-Sq	1.859575	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	10.94849	Pr > A-Sq	<0.0050

Table 22 shows that all the normality tests used resulted in a p-value which is less than 0.05, which means that Affordability has a specific distribution and was approximately normally distributed.

5.6.7 Availability

Plots to test normality:

Figure 34: Availability histogram

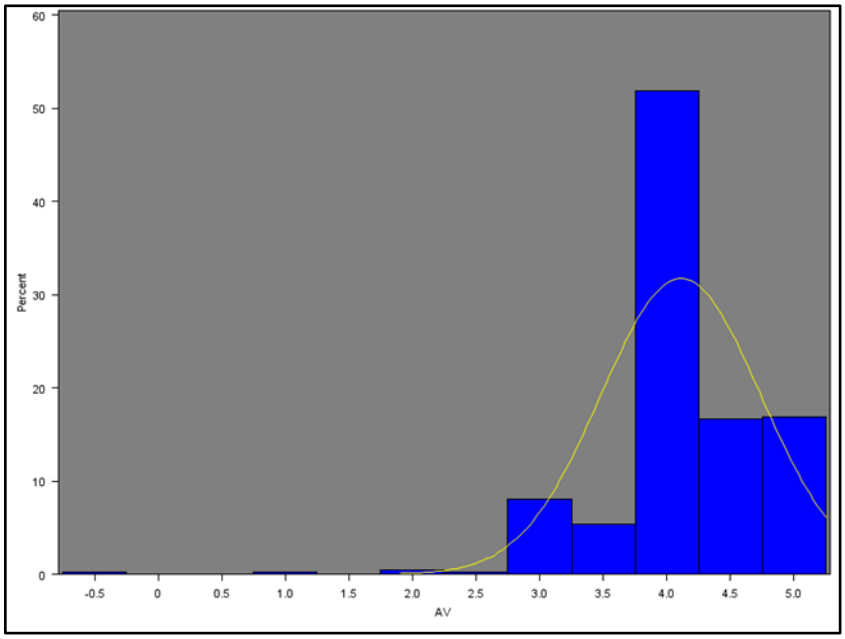


Figure 34 shows that Availability is approximately normally distributed because it has a bell-like shape, but is also slightly skewed to the right.

Figure 35: Availability Q-Q plot

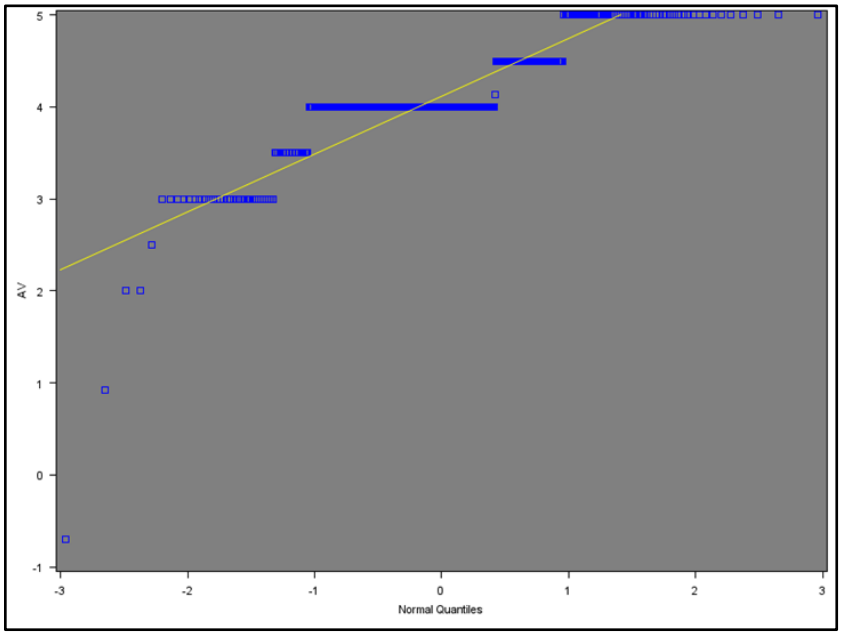


Figure 35 shows that the combination of the estimated values and the actual values are linearly related and they form a straight line. This shows that the Availability observations are approximately normally distributed. The factor had four outliers.

Tests for normality:

Table 23: Goodness-of-Fit Tests for Normal Distribution

Goodness-of-Fit Tests for Normal Distribution				
Test	**Statistic**		**p Value**	
Kolmogorov-Smirnov	D	0.282533	Pr > D	<0.0100
Cramer-von Mises	W-Sq	5.24669	Pr > W-Sq	<0.0050
Anderson-Darling	A-Sq	25.26732	Pr > A-Sq	<0.0050

Table 23 shows that all the normality tests used resulted in a p-value which is less than 0.05, which means that the Affordability has a specific distribution and was approximately normally distributed.

5.6.8 Test for normality summary

All the independent variables' plots showed that their observations were approximately normally distributed and some of the variables' histograms were slightly skewed to the right, with the Q-Q plots having an average of two outliers.

The normality tests all had p-values of less than 0.05 for all variables, which means that all variables had a specific distribution and were approximately normally distributed. The assumptions of normality were tested and validated.

5.6.9 Propositions

Regression was used to test the relationship between the factors measured by the questionnaire and the mobile data usage of respondents. The regression analysis outputs the beta, p-value, t-value, standard error and the 95% confidence interval. The t-value and the p-value were used to measure the significance or the influence of the factors on the usage of data.

The data received from the questionnaires did not aggregate to the different factors. The questions for each factor were grouped and an average was calculated for each factor. The average answer for each factor was then used to formulate the regression analysis. The null hypothesis for a regression analysis is that the beta of the variable is zero and the alternative hypothesis is that the beta is not zero. To interpret the results, if a p-value is less than 5% then reject the null hypothesis, and do not reject the null hypothesis if the p-value is over 5%.

The results can also be interpreted using the confidence interval. If the t value falls in the confidence interval we reject the null hypothesis, and if it falls out of the confidence interval we do not reject the null hypothesis. Table 24 below shows that the results of the regression analysis is used to assess the seven research questions.

Table 24: Regression analysis results

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Standardised Estimate	95% Confidence Limits	
Intercept	1	0.44509	0.55135	0.81	0.420	0	-0.6389	1.529
Perceived Usefulness - PU	1	0.47394	0.0734	6.46	<.0001	0.28005	0.32963	0.6182
Perceived Ease of Use - PEOU	1	0.09849	0.07771	1.27	0.206	0.05441	-0.0543	0.2513
Subjective Norm - SN	1	0.1188	0.06164	1.93	0.055	0.10758	-0.0024	0.24
Awareness - AW	1	0.46459	0.09407	4.94	<.0001	0.22735	0.27966	0.6495
Affordability - AF	1	-0.35826	0.05645	-6.35	<.0001	-0.27343	-0.4692	-0.247
Acceptability - AC	1	-0.25822	0.0613	-4.21	<.0001	-0.22612	-0.3787	-0.138
Availability - AV	1	0.1666	0.08502	1.96	0.051	0.08851	-0.0005	0.3337

Research proposition 1

The p-value of Perceived Ease of Use (PEOU) is more than 0.05, which means that we cannot accept proposition P1 and conclude that Perceived Ease of Use (PEOU) is not a significant factor for the adoption of mobile data services.

Research proposition 2

The p-value of Perceived Usefulness (PU) is less than 0.0001, which means that we accept proposition P2 and conclude that Perceived Usefulness (PU) is a significant factor for the adoption of mobile data services.

Research proposition 3

The p-value of Subject Norm (SN) is more than 0.05, which means that we cannot accept proposition P3 and conclude that Subjective Norm (SN) is not a significant factor for the adoption of mobile data services.

Research proposition 4

The p-value of Awareness (AW) is less than 0.0001, which means that we accept proposition P4 and conclude that Awareness (AW) is a significant factor for the adoption of mobile data services.

Research proposition 5

The p-value of Availability (AV) is more than 0.05, which means that we cannot accept proposition P5 and conclude that Availability (AV) is not a significant factor for the adoption of mobile data services.

Research proposition 6

The p-value of Affordability (AF) is less than 0.0001, which means that we accept proposition P6 and conclude that Affordability (AF) is a significant factor for the adoption of mobile data services.

Research proposition 7

The p-value of Acceptability (AC) is less than 0.0001, which means that we accept proposition P7 and conclude that Acceptability (AC) is a significant factor for the adoption of mobile data services.

5.6.10 Ranking of factors

Semi-partial correlation measures the relative importance of independent variables in determining a dependent variable. Table 25 below used semi-partial correlation to rank the importance of each factor.

Table 25: Ranking of factors

Factors	Semi-Partial Correlation	Rank
Perceived Usefulness - PU	0.0740	1
Affordability - AF	0.0714	2
Awareness - AW	0.0433	3
Acceptability - AC	0.0315	4
Availability - AV	0.0068	5
Subjective Norm - SN	0.0066	6
Perceived ease of use - PEOU	0.0029	7

Table 25 shows that Perceived Ease of Use and Subjective Norm are ranked the lowest, with Perceived Usefulness and Affordability being ranked the highest influencer of mobile data adoption.

5.6.11 Regression Analysis summary

The test for normality showed that all the factors were closely normally distributed and can construct a strong regression model. The regression model result showed that Perceived Ease of Use and Subjective Norm are factors which do not significantly influence the adoption of mobile data services from the sample, and Availability is the least significant of

the factors which significantly influence the adoption of mobile data services. Perceived Usefulness and Affordability were ranked the highest influencers of mobile data usage.

5.7 Conclusion

This chapter revealed the results of the various analyses conducted and presented the findings related to each proposition. The results for this study revealed that not all factors discussed in the literature review and in Chapter 3 are significant influencers in the adoption of mobile service at the BoP in South Africa. Table 26 below summarises the results of the various factors. The results presented in this chapter form the base for the discussion to follow in Chapter 6.

Table 26: Results summary of propositions

No.	Proposition	Result
P1	Perceived ease of use (PEOU) influences the adoption of mobile data services at the BoP.	Reject p-value > 0.05
P2	Perceived usefulness (PU) influences the adoption of mobile data services at the BoP.	Accept p-value < 0.0001
P3	Subjective Norm (SN) influences the adoption of mobile data services at the BoP.	Reject p-value > 0.05
P4	Awareness (AW) influences the adoption of mobile data services at the BoP.	Accept p-value < 0.0001
P5	Availability (AV) influences the adoption of mobile data services at the BoP.	Reject p-value > 0.05
P6	Affordability (AF) influences the adoption of mobile data services at the BoP.	Accept p-value < 0.0001
P7	Acceptability (AC) influences the adoption of mobile data services at the BoP.	Accept p-value < 0.0001

Chapter 6: Discussion of results

6.1 Introduction

The main objective of this research was to investigate the factors that influence the adoption of mobile data services in the BoP market in South Africa. The literature review in chapter two described the various aspects related to the framework utilised in the research to evaluate the significance of the investigated factors that influence mobile data adoption at the BoP in South Africa. The propositions developed in chapter three based on the factors identified were tested in the field, after which statistical analysis was performed on the data collected and the results presented in chapter five. The aim of chapter six is to discuss and verify the results against the literature reviewed, provide insights and finally conclusions on the study.

6.2 Sample description

Section A of the questionnaire (see Appendix B) posed nine statements to the respondents which elicited demographical data. The majority of respondents were female (56%) with their average mobile data usage being slightly lower (mean of 3.4) than the male respondents (mean of 3.5). This result contrasts with the gender divide study of mobile phone ownership by Zainudeen, Iqbal and Samarajiva (2010) on the Asian subcontinent, where male ownership of mobile phones dominated female ownership by almost 60%. An observation from this field survey was that female respondents were more receptive to the female field researchers from the Diepsloot Youth Forum than the male field research team, which could possibly explain the higher number of female respondents in the study.

Instant messaging platforms such as WhatsApp recorded the highest mobile data usage with a mean of 5.3, followed by browsing mobile data services which recorded a mean of 4.7. The usage of SMS services several times a day by the respondents was noted at 24%, which is significantly lower than the finding by Ramburn and Van Belle (2011), which highlighted SMS usage at 67%. This reduced usage pattern for SMS's could be attributed to the increasing adoption of instant messaging platforms such as WhatsApp (highest data usage mean of 5.3). These instant messaging platforms have enabled a reliable and affordable way to communicate in real time, and the high usage patterns clearly indicate that users have high acceptance levels of this mobile data service.

Ngwenya and Zikhali (2014) highlighted that the demographic composition of Diepsloot is characterised by a young population with an average age of around 25 years, with a greater dependency ratio (38.7%) towards the young. Respondents within the age group of 25-34 years accounted for 43% of all respondents (which is in line with the demographics of the area) and their average mobile data usage was the highest with a mean of 3.5. Blackberry, Nokia and Samsung mobile handsets were the most prevalent in the market. This could be possibly attributed to the easier operating or menu systems of these handsets, as well as these brands offering a wider variety of models that meet the price points of the consumers at the BoP (Calandro, Gillwald, Deen-Swarray, Stork, & Esselaar, 2012).

Blackberry is also known for offering the Blackberry Information Services (BIS) platform, which allows for browsing of internet and messaging platforms at a reduced price. Calandro et al. (2012) highlighted the proliferation and success of Blackberry mobile devices in the South African market, as even though there is a high initial handset cost, the lower usage and data browsing costs meet the price points of the BoP market.

A summary of the sample is listed below:

- Majority female
- Age group between 25 and 34 years
- Income group between R2000 and R2999
- Preferred mobile network Vodacom (37%)
- Use of Nokia, Blackberry, Samsung mobile handsets
- Respondents who use Blackberry handsets consume more data
- Respondents on Cell C and Telkom mobile network have a higher data usage mean (mean of 3.6)
- The majority of respondents do not use mBanking services

6.3 Research Proposition 1: Perceived Ease of Use (PEOU)

The first proposition (P1) of the research proposed a relationship with the construct of Perceived Ease of Use as a factor that influences the adoption of mobile data services at the BoP in South Africa.

- P1: Perceived Ease of Use (PEOU) influences the adoption of mobile data services at the BoP.

6.3.1 Discussion of findings on Proposition 1: Perceived Ease of Use (PEOU)

As discussed in the literature review, Perceived Ease of Use is the belief that using a technology or service will be free of effort (Davis, 1989). The items of the construct of PEOU were comprised of three statements (Q22, Q23, Q24 - see Appendix B) which were related to ease of use of the mobile data applications and internet on the cellphone, the actual installation of the mobile application on the cellphone, and the effort and time to connect to these mobile data services and applications.

The statements for PEOU had a reliability measure of 0.52 according to the Cronbach's Alpha analysis (see Table 13). Although a reliability measure of 0.52 is weak for the study, it is higher than the other constructs and provides a level of confidence that the statements within the construct provided adequate reliability in measuring the influence of PEOU on mobile data adoption at the BoP in South Africa. The statements for the PEOU construct can also be viewed as multi-dimensional, testing a different facet of the ease of use factor. The factor analysis confirmed the statement's multi-dimensionality of the construct (see Table 14). The Pearson correlation analysis revealed a positive relationship between PEOU and the factors of Subjective Norm and Acceptability, indicating the strength of association between these factors.

Tobbin (2010) explored the key factors that affect consumer behaviour towards the adoption and use of mobile money transfers in Ghana, and concluded that PEOU was a significant factor in influencing the adoption of mobile money services. Ismail and Masinge (2012), meanwhile, investigated the factors influencing the adoption of mobile banking services at the BoP in South Africa and also found PEOU to be a factor. Based on this, the expectation was that PEOU would be a significant factor that influences the adoption of mobile data services at the BoP in South Africa.

The regression analysis provided a p-value of 0.206 for PEOU, which is more than 0.05, indicating that it is not a significant factor for the adoption of mobile data services at the BoP in South Africa. This finding does not support the results of Tobbin (2010) or Ismail and Masinge (2012), where PEOU was highlighted as a significant factor in the adoption of mobile financial services. Yet the finding does support the research of Akturan and Tezcan (2012), revealing no direct relationship between PEOU and mobile data services adoption.

Various reasons could explain why the results do not support some of the literature. For example, the ubiquitous nature of cell phones and smartphones in the market may explain the higher level of understanding with regards to the usability of mobile devices and applications with BoP consumers in South Africa. Taking into account the relative age of

around 23 years of mobile communication services in South Africa and with 69% of the respondents being below the age of 35 years, this may possibly explain the easiness with which consumers could relate to the usability of mobile phones. Another possible reason could be attributed to the demographic make-up of Diepsloot, which has a young population that is skewed towards a higher young dependency ratio indicating the lower number of elderly people in the area (Ngwenya & Zikhali, 2014).

6.4 Research Proposition 2: Perceived Usefulness (PU)

The second proposition (P2) of the research proposes a relationship with the construct of PU as a factor that influences the adoption of mobile data services at the BoP in South Africa.

- P2: Perceived Usefulness influences the adoption of mobile data services at the BoP.

6.4.1 Discussion of findings on Proposition 2: Perceived Usefulness (PU)

The second key belief of TAM was the factor of PU, which can be described as the degree to which a person believes that using a particular system, technology or service will enhance their job performance (Davis, 1989). The items within the construct of PU were comprised of three statements (Q19, Q20, Q21 – see Appendix B), each of which related to mobile data applications and services facilitating or enhancing the job performance of the respondents, assisting in obtaining information and facilitating an easier and more convenient lifestyle.

The Cronbach's Alpha analysis revealed a reliability measure of 0.77. This indicates that the statements provided acceptable reliability in measuring the influence of PU on the adoption of mobile data services. The factor analysis confirmed the uni-dimensionality of the statements within the construct (see Table 13) in testing PU. The Pearson correlation analysis revealed a positive relationship or linear dependence between Perceived Usefulness and the factors of PEOU, Subjective Norm, Awareness, Acceptability and Availability.

The literature analysis found that PU is a significant factor in the adoption of mobile services or mobile financial services. Tobbin (2010) concluded that PEOU was a factor that influences consumer behaviour towards the adoption of mobile money services, while Suki and Suki (2011) and Akturan and Tezcan (2012) posited that PU was a significant factor in the adoption of mobile data services. From the literature analysis, it was expected that PEOU would be a significant factor that influences the adoption of mobile data services at the BoP.

The regression analysis confirmed a p-value of less than 0.0001. This indicates that PU is a significant factor that influences the adoption of mobile data service in the BoP in South Africa and is in alignment with the literature. The result supports Ismail and Masinge (2012), Suki and Suki, (2011) and Tobbin's (2010) findings regarding PEOU. The finding also supports Akturan and Tezcan's (2012) research conducted in Turkey that highlighted the positive relationship between consumers' PU of the mobile data service and its subsequent adoption.

This implies that consumers at the BoP will readily adopt and use mobile data services if they can attribute specific usefulness to that mobile data service in the form of assisting in job performance, access to useful information and allowing the consumer a more convenient and easier lifestyle. The finding also supports Ramburn and Van Belle's (2011) research which highlighted that the lack of need or use of a mobile service by consumers is a major inhibitor for the adoption of mobile data services.

6.5 Research Proposition 3: Subjective Norm (SN)

The third proposition (P3) of the research proposes a relationship with the construct of Subjective Norm as a factor that influences the adoption of mobile data services at the BoP in South Africa.

- P3: Subjective Norm (SN) influences the adoption of mobile data services at the BoP.

6.5.1 Discussion of findings on Proposition 3: Subjective Norm (SN)

Venkatesh and Davis (2000) argued that additional factors included in the TAM model will enhance the strength of existing models in ascertaining technology acceptance and adoption. The SN construct introduced describes the social influence, social pressure and social perception that impacts an individual with regards to the adoption of a technology or service (Fishbein & Ajzen, 1975; Tan & Teo, 2000). The SN construct consisted of three statements (Q25, Q26, Q27 – see Appendix B) that focused on the influence of friends and family, social influence, and self-importance or self-prestige associated with using mobile data services.

The statements for the construct of the SN revealed a reliability measure of 0.78 according to the Cronbach's Alpha, indicating that the statements provided acceptable reliability in measuring the influence of SN on the adoption of mobile data services. The factor analysis produced factor loadings of between 0.75 and 0.77 for each of the items, which indicated the uni-dimensionality of the items in measuring the construct of SN, thus ensuring

construct validity. Correlation analysis revealed positive relationships between the SN and each of the four As from the 4A framework.

A regression analysis tested the relationship between the factor of SN and the mobile data usage of the respondents. This revealed a p-value of 0.055, which was greater than 0.05, indicating that SN is not a significant factor influencing mobile data adoption at the BoP in South Africa. This result does not support the literature analysis and findings of Hasan et al. (2015), Tobbin (2013), Nakata and Weidner (2012) and Zainudeen and Ratnadiwakara (2011).

Chopra and Narayana (2012) highlighted the importance of technology as an enabler for serving the basic needs in developing markets or emerging economies. These needs or basic services may be enabled by the usefulness of a technology or service, which could possibly outweigh the social influence or sense of self-prestige (Lee et al., 2003) of a technology or service for fulfilling a basic need in this market. It can be concluded that SN is thus not a significant factor that influences the adoption mobile data service at the BoP.

6.6 Research Proposition 4: Awareness (AW)

The fourth proposition (P4) of the research proposes a relationship with the construct of Awareness as a factor that influences the adoption of mobile data services at the BoP in South Africa.

- P4: Awareness (AW) influences the adoption of mobile data services at the BoP.

6.6.1 Discussion of findings on Proposition 4: Awareness (AW)

Anderson and Billou (2007) described Awareness as a level or degree to which customers in the BoP markets are aware or knowledgeable of a product or service. SadreGhazi (2008) found that a lack of infrastructure and basic services hinders the use of media platforms to facilitate awareness of products or services in the BoP. The Awareness construct in the questionnaire consisted of three statements (Q28, Q29, Q30 – see Appendix B) related to consumers' knowledge of mobile data applications; receiving of information, campaigns and updates related to mobile data services; and awareness of new applications.

The Cronbach's Alpha revealed a measure of 0.15 which can be regarded as weak. This could indicate that the statements did not significantly test the construct or that the construct could have multi-faceted items related to Awareness. Multi-dimensionality can be associated with the Awareness construct as the statements elicited levels of Awareness but from various aspects. The factor analysis confirmed the multi-dimensionality of the

items or statements within the construct, while the Pearson correlation highlighted a positive relationship between Awareness and Availability.

Anderson and Billou (2007) argued that non-conventional awareness programmes at the BoP are important to ensure that consumers are able to notice, interpret and understand the products and services within the market. SadreGhazi (2008) also revealed the positive impact of awareness programmes to enhance customer experience of mobile technology in India.

Based on the literature, it was expected that Awareness would be a significant factor that influences the adoption of mobile data services at the BoP. As the Regression Analysis revealed a p-value of less than 0.0001, this indicates that the Awareness factor is a significant factor influencing the adoption of mobile data services at the BoP. The analysis result reinforces and supports the findings of Anderson and Billou (2007) and SadreGhazi (2008). The result is also aligned with Hasan et al.'s (2015) argument that the BoP consumers utilise more pictographic symbols to improve awareness of products, leading to the greater adoption of products and services in this market.

The inference that can be made from this finding is that in the BoP market, well planned awareness campaigns, non-conventional media platforms and improving mobile data application updates and information will lead to greater adoption of mobile data services.

6.7 Research Proposition 5: Availability (AV)

The fifth proposition (P5) of the research proposes a relationship with the construct of Availability as a factor that influences the adoption of mobile data services at the BoP in South Africa.

- P5: Availability (AV) influences the adoption of mobile data services at the BoP.

6.7.1 Discussion of findings on Proposition 5: Availability (AV)

Anderson and Billou (2007) described Availability as the extent to which customers are able to easily acquire and use products and services at the BoP. Major obstacles associated with limited infrastructure, basic services and limited or non-existent distribution channels exacerbate the problem of availability of products and services at the BoP (Anderson & Billou, 2007; Prahalad, 2005; Prahalad & Hammond, 2002; Prahalad & Hart, 1999). Mobile data services are heavily dependent on complex mobile telecommunication infrastructure and platforms to provision these services. These systems and infrastructure include network availability and coverage, amount of data transfer required by the mobile

application, as well the actual data amount (airtime/data billing) available on the customer's mobile handset.

The Availability construct was comprised of two statements (Q35, Q36 – see Appendix B) related to the Availability of the mobile network from a coverage or radio signal perspective and the Availability of airtime/data vouchers, vendors and stores that lead to the purchase of vouchers in the area.

The Cronbach's Alpha revealed a reliability measure of 0.35 which is considered weak for the study. Again, the multi-dimensionality of the statements can be attributed to the weak measure in the Cronbach's Alpha as each of the statements indicated the relevance to availability of cellular signal and data/airtime sales points in the area. The correlation analysis showed a positive relationship between Availability and Perceived Usefulness, Subjective Norm and Awareness.

Smart Communications' extensive mobile network coverage and innovative solution to air time distribution minimised their physical product distribution, increased mobile usage and ultimately increased revenues for the company (Anderson & Billou, 2007). SadreGhazi (2008) emphasised that lack of infrastructure, distribution channels and basic services can significantly impact the availability of products and services, resulting in decreased adoption of the product or service in the BoP.

The regression analysis showed a p-value of 0.051, which indicated that Availability is not a significant factor influencing the adoption of mobile data services at the BoP. This finding does not support the literature analysis and findings of Anderson and Billou (2007) and SadreGhazi (2008), however the result is in alignment with Ramburn and Van Belle (2011), highlighting that lack of coverage and unreliability of technology were the last two inhibitors of mobile data service usage.

The pervasive nature of mobile phones and extensive network coverage by all mobile network operators could be possible attributes that explain the non-significance of the Availability factor in the study. BMI's (2015) report on the South African telecommunications landscape highlights the increase in infrastructure roll out of new 3G (Third Generation) and 4G (Fourth Generation) radio sites that allow for extensive coverage throughout South Africa and a higher capacity mobile data network. The widespread availability of recharge airtime and data throughout the rural township via spaza shop dealers and other informal air time sellers (voucher dealers on bicycles in

townships) could also explain the extensive distribution network and thus explain the non-significance of the factor.

6.8 Research Proposition 6: Affordability (AF)

The sixth proposition (P6) of the research proposes a relationship with the construct of Affordability as a factor that influences the adoption of mobile data services at the BoP in South Africa.

- P6: Affordability (AF) influences the adoption of mobile data services at the BoP.

6.8.1 Discussion of findings on Proposition 6: Affordability (AF)

The concept of Affordability describes the degree to which a company's products or services are affordable to the customer at the BoP (Anderson & Billou, 2007). Characterised by extremely low levels of disposable income, daily wages instead of salaries, cash flow problems and no formal access to credit, BoP customers are highly susceptible to the cost and price of products and services in their market (Karnani, 2007; Prahalad & Hammond, 2002; SadreGhazi, 2008).

The construct of Affordability was tested by two statements (Q31, Q32 – see Appendix B), which related to the respondents' perspectives on cost and pricing plans for mobile data service, as well their frequency of purchase of airtime/data recharge vouchers. The Cronbach's Alpha revealed a reliability measure of -0.12, indicating a negative inter-correlation score between the statements. Although the result's reliability is weak, the multi-dimensionality of the construct was tested and the statements were in line with acquiring a respondent's perception of the cost and pricing of mobile data services, as well testing how often the respondents purchase recharge vouchers which address the purchasing patterns and thus Affordability. Factor analysis concluded that the statements are not clustered under one factor and are in line with the Cronbach's Alpha.

Karnani (2007) and Prahalad and Hammond (2002) confirmed that consumers in the BoP market satisfy their basic needs first and are highly cost conscious, while Ismail and Masinge (2012) found perceived cost to be a significant factor in the adoption of mobile financial services in the BoP. Smart Communications adopted the micro-pack strategies of Unilever and Proctor & Gamble and reduced its prepaid airtime vouchers to affordable price points to meet the needs of the cost and price conscious consumers at the BoP (Anderson & Billou, 2007). Ramburn and Van Belle (2011) further concluded that cost of service, which is linked to Affordability, was the major inhibitor for the usage of mobile data

services. Based on the literature, Affordability was expected to be a significant factor influencing the adoption of mobile data service in the BoP.

A p-value of less than 0.0001 was revealed by the regression analysis, indicating that Affordability is a significant factor influencing the adoption of mobile data services. This finding is in line with the expectation that affordability is a significant factor influencing the adoption of mobile data services and supports the arguments of Ismail and Masinge (2012), Karnani (2007), Prahalad and Hammond (2002) and Ramburn and Van Belle (2011). The finding also supports Ramburn and Van Belle's (2011) discovery that lower prices of mobile data services are the most important factor encouraging the use of mobile data services.

Analysis regarding the income groups, mobile data usage, purchasing patterns and amount spent on airtime/data vouchers revealed that mobile data usage increases within lower income group levels, excluding the no income group. The average monthly spend per individual is more than R250, which is significant and highlights that individuals are spending on average between 6% and 24% of their monthly incomes on mobile services. This result is significantly higher than the finding by Subrahmanyan and Gomez-Arias (2008), which again reveals the pervasive nature of mobile telecommunication services and indicates the relative importance of mobile services ascribed by individuals at the BoP. The no income grouping had an average monthly spend of R191, was comprised mainly of 16-24 year olds (64%), and had a mean usage of mobile data of 3.2. A possible explanation for the no income group's purchasing behaviour and funding of airtime and data purchases could possibly lie in the collectivist household income approach as highlighted by Chipp et al. (2013) . This could explain how this no income group accesses funds from other household members to fund their mobile data needs. Purchasing patterns of airtime and data revealed that the majority of the individuals buy smaller or reduced value airtime/data many times in a week in order to meet their cash flow and price point needs, which is in line with the arguments by Anderson and Billou (2007), Prahalad and Hammond (2002) and SadreGhazi (2008). These frequent and reduced amount purchasing patterns highlight the demand for mobile services at the BoP, which could possibly be utilised as a base for more innovative and cost- or affordability-focused mobile data services.

The finding concludes that Affordability is a significant factor influencing the adoption of mobile data services at the BoP in South Africa.

6.9 Research Proposition 7: Acceptability (AC)

The seventh proposition (P7) of the research proposes a relationship with the construct of Acceptability as a factor that influences the adoption of mobile data services at the BoP in South Africa.

- P7: Acceptability (AC) influences the adoption of mobile data services at the BoP.

6.9.1 Discussion of findings on Proposition 7: Acceptability (AC)

Acceptability describes the degree to which consumers trust or accept a product or service and are willing to consume, distribute or sell those products and services (Anderson & Billou, 2007). SadreGhazi (2008) highlighted the strategy of the Haier Group of China, a leading manufacturer of home appliances, which redesigned and adapted their product offerings to meet the needs of rural consumers in order to gain acceptance of their products in the market. Celtel in Uganda also addressed the lack of Acceptability of mobile phones by ensuring that the limitation of the erratic national electricity supply was resolved by providing low cost power generators to retailers and distributors of airtime vouchers so that consumers were able to recharge their handsets at airtime sales points (Anderson & Billou, 2007).

The Acceptability construct was comprised of two statements (Q33, Q34 – see Appendix B) related to the Acceptability of mobile data services. The statements were based on the level of trust by respondents of mobile data services as well as their liking of the mobile data services. The Cronbach's Alpha revealed a reliability measure of 0.51 which is considered poor. This could be attributed to the two statements testing different facets but related to the construct. The respondents' Acceptability of the service from a liking perspective as well as the respondents' trust level of the service were tested. The factor analysis confirmed the multi-dimensionality of the statements.

Tobbin (2012) highlighted trust as a significant factor that influences the adoption of mobile financial services in the unbanked sector in Ghana, while Ismail and Masinge (2012) noted that customers' trust in mobile data services such as mobile banking is likely to influence the adoption of a mobile data service. Tobbin's (2010) earlier study in Uganda concluded that trust is a significant factor influencing the adoption of mobile money services, while Hasan et al. (2015) posited that enjoyment (liking of a product or service) and compatibility, linked to acceptance of the product or service, have a greater influence than Perceived Usefulness, Perceived Value and Perceived Ease of Use on the adoption of products and services in the BoP. The literature drives the notion that Acceptability, based

on the statements of trust and liking of mobile data services, is a significant factor influencing the adoption of mobile data services.

The regression analysis revealed a p-value of less than 0.0001 at a 95% level of significance, indicating that Acceptability is a significant factor influencing the adoption of mobile data services at the BoP in South Africa. This finding is in line with and supports the literature and arguments by Hasan et al. (2015), Ismail and Masinge (2012), Tobbin (2012) and Tobbin (2010).

This implies that a greater level of trust and enjoyment of mobile data services by the consumers in the BoP will lead to a greater degree of Acceptability, which will in turn influence the adoption of mobile data services in this market. Based on this, it can be concluded that Acceptability is a significant factor influencing the adoption of mobile data service at the BoP in South Africa.

6.10 Ranking of factors

A semi-partial correlation highlighted the ranking of factors for the study. Perceived Usefulness (first) and Affordability (second) were ranked the most important factors, while Perceived Ease of Use and Subjective Norm were the lowest ranked factors. This implies that Perceived Usefulness and Affordability are the two most significant factors influencing the adoption of mobile data services at the BoP. The factors of Awareness and Acceptability were ranked third and fourth respectively. The ranking of the factors assists in highlighting the main predictors of mobile data adoption and thus provides insight into a framework for increasing mobile data services adoption at the BoP.

6.11 Conclusion

In order to drive greater adoption of mobile data services at the BoP, mobile network operators need improved strategies and programmes around the factors of Perceived Usefulness, Awareness, Affordability and Acceptability. This study reveals that these four factors are significant in influencing mobile adoption at the BoP in South Africa. Consumers that can assign a PU for a mobile data service are found to readily adopt the service, as this is beneficial and convenient for their lifestyle.

Mobile network operators as well vendors of mobile data applications and services have the ability to drive the use of mobile data services with specific awareness campaigns and media platforms that are tailored for this market. Consumers are likely to increase adoption rates of mobile data services if the relevant information, awareness and marketing of such mobile data services are driven at the BoP market.

The BoP market is characterised by low incomes, cash flow problems, and price and cost sensitivity. In order for operators to drive the adoption of mobile data services at the BoP, exceptional price point offerings need to be developed that offer the consumer the best value in terms of cost per data unit. As is evident from the consumers with Blackberry handsets, the BIS platform allows them an attractive price plan and drives data usage, as can be confirmed from the high data usage mean in the study.

Acceptability of mobile data services at the BoP can be driven by increasing the degree of trust between mobile data applications and consumers in this market. This can be achieved by offering products and services that have a specific or adapted need for the BoP consumers. The enjoyment factor (liking a mobile data service) also increases Acceptability and thereby influences the adoption of the service.

Chapter 7: Conclusion

7.1 Introduction

This study investigated the factors that influence the adoption of mobile data services at the BoP in South Africa. A conceptual framework was developed from the constructs identified in the literature review which consisted of the following constructs: Perceived Usefulness, Perceived Ease of Use, Subjective Norm, Availability, Affordability, Awareness and Acceptability. The framework was then tested in the informal township of Diepsloot and the results were presented.

This chapter summarises the key findings of the research, provides insights into the practical and business implications of the findings, and provides recommendations for future research in the area of mobile data and services at the BoP. A final concluding statement is also provided

7.2 Main findings

This study investigated the factors that influence the adoption of mobile data services in the BoP markets in South Africa by creating a conceptual framework based on the extended Technology Acceptance Model (TAM2) (Venkatesh & Davis, 2000) and the 4A model (Anderson & Billou, 2007) . Some of the main findings of the research revealed that the top two highest mobile data usage means amongst BoP consumers were attributed to the instant messaging platform WhatsApp, as well browsing of the internet to access information, news and latest updates. The affinity towards instant messaging by the BoP and the low cost-based structure of WhatsApp can be linked to the decreased usage patterns of SMS-based services in the BoP.

BoP consumers in the study viewed Perceived Usefulness as an important factor that influences their adoption of mobile data service. The more value, convenience and intrinsic usefulness a mobile data service can offer a BoP consumer, the more likely the service will be adopted and used.

The Affordability factor was highlighted as a significant one that influences the adoption of mobile data services in the BoP. Although the BoP consumers in the study revealed an average individual spend of more than R250 per month on mobile services, which is a significant portion of the monthly income (between 6% - 24% of monthly income), they are constantly seeking services and products that meet their price points as well offer the most value.

The advanced deployment and extensive network coverage of mobile communications at the BoP in South Africa, as well as widespread availability of air time and mobile vouchers, has highlighted that the Availability factor is not a significant influencer of mobile data services adoption at the BoP. This is a positive result for MNOs as it indicates the BoP consumers' satisfaction with network coverage and radio signal strength and highlights the extensive airtime/voucher vendor presence in the BoP.

Based on the literature review, the factor of Subjective Norm was expected to be a significant factor influencing mobile data adoption, however the study revealed that the BoP consumers in South Africa do not view Subjective Norm as being a significant factor on mobile data services adoption. This an interesting finding as it may indicate that BoP consumers in South Africa are more focused on the value and usefulness of mobile data services/applications than the social influence or social norm of the mobile data service.

The factor of Acceptability in the conceptual framework related to the level of trust and enjoyment or liking of mobile data services by the BoP consumers. The results of the study support the literature, with Acceptability being viewed as a predictor or influencer of mobile data service at the BoP. The finding highlights that BoP consumers are attentive to the trust facet and are aware of their personal detail and information that may be loaded onto mobile data services. By ensuring that a high level of trust (in the form of mobile data services relating directly to the individual BoP consumer) is built between the user and mobile data application, adoption rates of mobile data services in the BoP could possibly rise. The of notion of enjoyment or liking of the mobile data service application by the BoP consumers may be a facet that allows the users some form of escapism from the reality of the BoP environment. Mobile data services and applications that drive the enjoyment facet thus ensure Acceptability of the service by the BoP user and hence positively influence the adoption of the mobile data service.

7.3 Business implications and recommendations

With a competitive landscape in the telecommunications industry, MNOs require new avenues, business models and customers segments in order to maintain sustainable operations. The main findings in this study will assist MNOs to identify consumer targeted strategies to enhance mobile data adoption in the BoP markets of South Africa. These are listed below:

- One of the highlights of the study revealed that a younger population was dominant in the BoP area surveyed. MNOs should provide or develop mobile content and mobile data applications that are targeted specifically to this younger age group.

- The study revealed the higher ownership of Nokia, Blackberry and Samsung mobile handsets, which have a combination of easy menu and operating systems as well as data efficient platforms that are attractive to the BoP market. MNOs could further leverage this trend and offer network specific value bundles, services and platforms that are associated with these device manufacturers. MNOs could also further invest into introducing more low cost and data efficient platform handsets that may assist in driving mobile data at the BoP.
- The BoP segment is more inclined to adopt and use a mobile data product or service if they can associate a specific or intrinsic usefulness from the product or service. MNOs should develop and market more mobile data products, applications and services that have specific usefulness and a high convenience aspect for this market, thus ensuring that consumers in this segment continue to adopt these services.
- MNOs should leverage the non-traditional media platforms, enhanced customer specific information and location-based channels in order to provide information on new mobile applications, services and products in the BoP. Consumers in these segments are likely to adopt and use mobile data services if they are aware of updates and new mobile data services.
- MNOs could explore more location-based mobile data services and applications in order to address the local needs and requirements of the BoP consumers. This might ensure that a locally-based economic ecosystem is created for mobile data applications for that specific BoP area, which allows consumers to trade other goods and services based on these applications.
- Affordability has been highlighted as a key factor that influences mobile data service adoption. MNOs should continue to explore more innovative pricing plans and cost structures for mobile data services. BoP customers demand value, product or service usefulness and pricing plans that meet their pockets.

7.4 Recommendations for future research

The recommendations for future research are based on the limitations of the current study, insights gained from the literature review, as well as the findings of the study.

The ubiquitous nature of mobile phones and smartphone penetration has been highlighted in the study. This aspect provides insight into mobile users' understanding of mobile devices and applications. Further qualitative research can be conducted to ascertain what specific mobile content or application requirements mobile users in the BoP will need to ensure that their social, economic and entertainment needs are met.

The multi-dimensionality of factors within some the constructs were highlighted in the study. Further research can be conducted utilising other factors within some of the constructs that test facets of mobile data services, such as trialling of content or mobile services, payment channels for mobile services and cost effective or data efficient mobile applications.

Another recommendation for further research in the area of mobile data services applications and content adoption could be to investigate factors associated with characteristics of the Innovation Diffusion Theory (IDT), namely Relative Advantage, Compatibility, Complexity, Trialability and Observability.

The study focused solely on one informal township in Gauteng (Diepsloot) and provided insight into consumer purchasing patterns, mobile user patterns as well consumer behaviour in this area. A multi-informal township study can be conducted to ascertain similarities and differences between various regions of the South African BoP market. This will provide a more informative and deeper understanding or view on the mobile data adoption patterns of the BoP market in South Africa.

7.5 Conclusion

The aim of this research was to investigate the factors that influence the adoption of mobile data services in the BoP of South Africa. The research has indicated that not all factors explored are significant predictors or influencers of mobile data services adoption in the BoP of South Africa. The study highlighted the factors of Perceived Ease of Use, Subjective Norm and Availability as factors that do not influence the adoption of mobile data services at the BoP in South Africa. The following factors in the study: Perceived Usefulness, Awareness, Affordability and Acceptability were highlighted as influencers of mobile data services at the BoP in South Africa.

References

Ajzen, I. (1991). The theory of planned behavior. *Theories of Cognitive Self-Regulation*, *50*(2), 179–211. http://doi.org/10.1016/0749-5978(91)90020-T

Akturan, U., & Tezcan, N. (2012). Mobile banking adoption of the youth market: Perceptions and intentions. *Marketing Intelligence & Planning*, *30*(4), 444–459.

Anderson, J., & Billou, N. (2007). Serving the world's poor: innovation at the base of the economic pyramid. *Journal of Business Strategy*, *28*(2), 14–21. http://doi.org/10.1108/02756660710732611

Bagozzi, R. P. (2007). The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems*, *8*(4), 3.

Bina, M., & Giaglis, G. M. (2005). Exploring early usage patterns of mobile data services (pp. 363–369). Presented at the Mobile Business, 2005. ICMB 2005. International Conference on IEEE , Sydney.

BMI. (2014). *South African Telecommunications Report 2014 Q4*. Retrieved from http://www.marketresearch.com/Business-Monitor-International-v304/Telecommunications-South-Africa-Q4-8352183/

BMI. (2015). *South African Telecommunications Report 2015 Q4*. Retrieved from http://www.marketresearch.com/Business-Monitor-International-v304/South-Africa-Business-Forecast-Q1-8467823/

Calandro, E., Gillwald, A., Deen-Swarray, M., Stork, C., & Esselaar, S. (2012). Mobile usage at the base of the pyramid in South Africa. *An infoDev Publication Prepared by Research ICT Africa and Intelecon*.

Census. (2011). *Census 2011*. Retrieved from http://census2011.adrianfrith.com/

Chavula, H. K. (2012). Telecommunications development and economic growth in Africa. *Information Technology for Development*, *19*(1), 5–23. http://doi.org/10.1080/02681102.2012.694794

Chipp, K., Corder, C., & Kapelianis, D. (2012). Where practice meets theory: defining and reviewing the bottom of the pyramid for South African marketers. *Management Dynamics: Journal of the Southern African Institute for Management Scientists*, *21*(1), 18–29.

Chipp, K., Corder, C., & Kapelianis, D. (2013). The role of collectivism in defining the South African Bottom of the Pyramid. *Management Dynamics: Journal of the Southern African Institute for Management Scientists*, *22*(1), 2–13.

Chopra, S. K., & Narayana, M. (2012). *Meeting Bottom of the Pyramid (BOP) needs by engineering sustainable solutions* (pp. 1–6). Presented at the Technology and Society in Asia (T&SA), 2012 IEEE Conference on, IEEE.

Cooper, D., & Schindler, P. (2013). *Business Research Methods* (12th ed.). New York: McGraw-Hill Education.

Czernich, N., Falck, O., Kretschmer, T., & Woessmann, L. (2011). Broadband Infrastructure and Economic Growth*. *The Economic Journal*, *121*(552), 505–532. http://doi.org/10.1111/j.1468-0297.2011.02420.x

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, *13*(3), 319–340. http://doi.org/10.2307/249008

Deloitte. (2014). *The future of Telecoms in Africa*. Retrieved from http://www2.deloitte.com/content/dam/Deloitte/ke/Documents/technology-media-telecommunications/DeloitteEA_TMT_FutureTelecomms_2014.pdf

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley Publishing Co.

Gliem, J. A., & Gliem, R. R. (2003). *Calculating, interpreting, and reporting Cronbach's alpha reliability coefficient for Likert-type scales.* Columbus, OH: Midwest Research-to-Practice Conference in Adult, Continuing, and Community Education.

GSMA. (2014). *The Mobile Economy 2014*. Retrieved from http://www.gsmamobileeconomy.com/GSMA_ME_Report_2014_R2_WEB.pdf

Hardy, A. P. (1980). The role of the telephone in economic development. *Telecommunications Policy*, *4*(4), 278–286.

Hasan, M. R., Lowe, B., & Petrovici, D. (2015). *Empirical comparisons of key innovation adoption models in the context of the Bottom of the Pyramid (BOP).* Retrieved from http://am2015.exordo.com/files/papers/197/final_draft/AM_Final__Submission_Paper.pdf

Ismail, T., & Masinge, K. (2012). Mobile banking: innovation for the poor. *African Journal of Science, Technology, Innovation and Development, 4*(3), 98–127.

Jacobsen, K. F. L. (2003). *Telecommunications-a means to economic growth in developing countries?* Bergen: Chr. Michelsen Institute.

Karnani, A. (2007). The Mirage of Marketing to the Bottom of the Pyramid. *California Management Review*, *49*(4), 90–111.

Kim, B., Choi, M., & Han, I. (2009). User behaviors toward mobile data services: The role of perceived fee and prior experience. *Expert Systems with Applications*, *36*(4), 8528–8536. http://doi.org/10.1016/j.eswa.2008.10.063

Lee, M. S., McGoldrick, P. J., Keeling, K. A., & Doherty, J. (2003). Using ZMET to explore barriers to the adoption of 3G mobile banking services. *International Journal of Retail & Distribution Management*, *31*(6), 340–348.

Lee, S., Marcu, M., & Lee, S. (2011). An empirical analysis of fixed and mobile broadband diffusion. *Information Economics and Policy*, *23*(3–4), 227–233. http://doi.org/10.1016/j.infoecopol.2011.05.001

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information & Management*, *40*(3), 191–204. http://doi.org/10.1016/S0378-7206(01)00143-4

Linna, P. (2012). Base of the pyramid (BOP) as a source of innovation: Experiences of companies in the Kenyan mobile sector. *International Journal of Technology Management & Sustainable Development*, *11*(2), 113–137.

Madden, G., & Savage, S. J. (1998). CEE telecommunications investment and economic growth. *Information Economics and Policy*, *10*(2), 173–195.

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review*, *50*(4), 370.

Nakata, C., & Weidner, K. (2012). Enhancing new product adoption at the base of the pyramid: a contextualized model. *Journal of Product Innovation Management*, *29*(1), 21–32.

Ngwenya, P., & Zikhali, P. (2014). Income and Expenditure Patterns in Diepsloot. *Economics of South African Townships* (219-244).Washington, DC: World Bank Publications.

Pew Research Centre. (2015). *Africa Cell Phone Report*. Retrieved from http://www.pewglobal.org/files/2015/04/Pew-Research-Center-Africa-Cell-Phone-Report-FINAL-April-15-2015.pdf

Prahalad, C. K. (2005). *The Fortune at the Bottom of the Pyramid: Eradicating Poverty Through Profits*. Upper Saddle River, NJ: Wharton School Publishing.

Prahalad, & Hammond, A. (2002). Serving the world's poor, profitably. *Harvard Business Review*, *80*(9), 48–59.

Prahalad, & Hart, S. L. (1999). Strategies for the bottom of the pyramid: Creating sustainable development (Working paper). Ann Arbor: University of Michigan.

Ramburn, H., & Van Belle, J. (2011). Use and Adoption of Mobile data services in Africa: An Emprical study in Mauritius and South Africa. *International Journal of E-Education, E-Business, E-Management and E-Learning*, *1*(1), 28–34.

Rogers, E. M. (1995). *Diffusion of innovations*. New York: The Free Press.

Röller, L-H., & Waverman, L. (2001). Telecommunications infrastructure and economic development: A simultaneous approach. *American Economic Review*, *91*(4), 909–923.

SadreGhazi, S. (2008). Addressing low-income markets: Reframing corporate business strategies. *Oikos Ph. D. Summer Academy*.

Saunders, M., & Lewis, P. (2012). *Doing research in business management*. Edinburgh Gate: Pearson Education.

Subrahmanyan, S., & Gomez-Arias, J. (2008). Integrated approach to understanding consumer behavior at bottom of pyramid. *Journal of Consumer Marketing*, *25*(7), 402–412. http://doi.org/10.1108/07363760810915617

Suki, N. M., & Suki, N. M. (2011). Exploring the relationship between perceived usefulness, perceived ease of use, perceived enjoyment, attitude and subscribers' intention towards using 3G mobile services. *Journal of Information Technology Management*, *22*(1), 1–7.

Tan, M., & Teo, T. S. (2000). Factors influencing the adoption of Internet banking. *Journal of the AIS*, *1*(1), 5.

Taylor, S., & Todd, P. (1995). Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions. *International Journal of Research in Marketing*, *12*(2), 137–155. http://doi.org/10.1016/0167-8116(94)00019-K

Thompson Jr., H. G., & Garbacz, C. (2011). Economic impacts of mobile versus fixed broadband. *Telecommunications Policy*, *35*(11), 999–1009. http://doi.org/10.1016/j.telpol.2011.07.004

Tobbin, P. (2010). Modeling adoption of mobile money transfer: a consumer behaviour analysis. Presented at the The 2nd International Conference on Mobile Communication Technology for Development. Kampala, Uganda.

Tobbin, P. (2012). Towards a model of adoption in mobile banking by the unbanked: a qualitative study. *Info*, *14*(5), 74–88. http://doi.org/10.1108/14636691211256313

Tobbin, P. (2013). A qualitative investigation of use and adoption of mobile money in Kenya: a domestication approach. *International Journal of Wireless and Mobile Computing*, *6*(4), 338–354.

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science*, *46*(2), 186.

Wegner, T. (2010). *Applied business statistics: Methods and Excel-based applications*. Cape Town: Juta and Company Ltd.

Wiid, J., & Diggines, C. (2009). *Marketing Research*. Cape Town: Juta and Company.

Zainudeen, A., Iqbal, T., & Samarajiva, R. (2010). Who's got the phone? Gender and the use of the telephone at the bottom of the pyramid. *New Media & Society*, *12*(4), 549–566.

Zainudeen, A., & Ratnadiwakara, D. (2011). Are the poor stuck in voice? Conditions for adoption of more-than-voice mobile services. *Information Technologies & International Development*, *7*(3), pp–45.

APPENDICES

Appendix A: Consistency Matrix

Title: Factors influencing the adoption of mobile data services in BoP markets in South Africa.

Proposition	Literature Review	Data Collection Tool	Analysis
P1: Perceived Ease of Use (PEOU) influences the adoption of mobile data services at the BoP.	(Davis, 1989) (Fishbein & Ajzen, 1975) (Ajzen, 1991) (Venkatesh & Davis, 2000)	Questionnaire – Q22, Q23, Q24	Descriptive Analysis Reliability Analysis Correlation Analysis Regression Analysis
P2: Perceived Usefulness (PU) influences the adoption of mobile data services at the BoP.	(Davis, 1989) (Fishbein & Ajzen, 1975) (Ajzen, 1991) (Venkatesh & Davis, 2000)	Questionnaire – Q19, Q20, Q21	Descriptive Analysis Reliability Analysis Correlation Analysis Regression Analysis
P3: Subjective Norm (SN) influences the adoption of mobile data services at the BoP.	(Davis, 1989) (Fishbein & Ajzen, 1975) (Ajzen, 1991) (Venkatesh & Davis, 2000)	Questionnaire – Q25, Q26, Q27	Descriptive Analysis Reliability Analysis Regression Analysis Regression Analysis
P4: Awareness (AW) influences the adoption of mobile data services at the BoP.	(Anderson & Billou, 2007) (Zainudeen & Ratnadiwakara, 2011)	Questionnaire – Q28, Q29, Q30	Descriptive Analysis Reliability Analysis Correlation Analysis Regression Analysis
P5: Availability (AV) influences the adoption of mobile data services at the BoP.	(Anderson & Billou, 2007) (Zainudeen & Ratnadiwakara, 2011) (Ramburn & Van Belle, 2011)	Questionnaire – Q35, Q36	Descriptive Analysis Reliability Analysis Correlation Analysis Regression Analysis

P6: Affordability (AF) influences the adoption of mobile data services at the BoP.	(Anderson & Billou, 2007) (Zainudeen & Ratnadiwakara, 2011) (Ramburn & Van Belle, 2011)	Questionnaire – Q31, Q32	Descriptive Analysis Reliability Analysis Correlation Analysis Regression Analysis
P7: Acceptability (AC) influences the adoption of mobile data services at the BoP.	(Anderson & Billou, 2007) (Zainudeen & Ratnadiwakara, 2011) (Ramburn & Van Belle, 2011)	Questionnaire – Q33, Q34	Descriptive Analysis Reliability Analysis Correlation Analysis Regression Analysis

Appendix B: Questionnaire

Consent Form

Dear participant,

I am conducting research to understand the factors influencing the adoption of mobile data (cellphone internet and other mobile applications). In order to assist me with my study I kindly request your participation by completing a survey on a set number of questions. This will help me understand the most significant factors that lead to adoption of mobile data.

The questionnaire has only 36 questions and should take no longer than 10 minutes of your time to complete. Your participation is voluntary and you can withdraw at any time without penalty. All information will be used for aggregate data purposes in this study and kept confidential. By completing the survey, you indicate that you voluntarily participate in this research. If you have any concerns, please contact my supervisor or myself. Our details are provided below.

Researcher Name: Yogan Govender
Email: 439372@mygibs.co.za
Phone: +27 82 998 1218

Research Supervisor Name: Marcus Carter
Email:Marcus_carter@hotmail.com
Phone: +61 468 799 770

A. Demographics			
#	Question	Category	Response: Please mark with an "X"
Q1	Gender?	Male	
		Female	
Q2	What is your age group?	16-24 years	
		25-34 years	
		35-49years	
		50 yrs. and over	
Q3	Monthly Income?	No Income	
		Between R1-R999	
		Between R1000-R1999	
		Between R2000-2999	
		Between R3000-R5000	
		YES	NO
Q4	Do you own cellphone?		
Q5	If yes, is it a smart phone (a cell phone that has WhatsApp /Facebook/ Google /Email loaded)		
Q6	What make of phone do you have (Samsung, Nokia,Iphone,Blackberry etc.)		
Q7	Are you a prepaid user?		
Q8	Which network is your cellphone on? (MTN, Vodacom, CellC, Telkom Mobile)		
Q9	How much do you spend on airtime/data per week?		

B. Mobile Use							
#	Question	Once a Day	Many Times in a Day	Once a Week	Many times in a Week	Once a Month	Never
Q10	How often do you send SMS's						
Q11	How often do you use WhatsApp/Online Chats/Facebook/BBM						
Q12	How often do you download or buy ringtones on your cell phone						
Q13	How often do you browse and search for information on the internet from your cellphone (Go on the internet on your cellphone)						
Q14	How often do you use cellphone banking/ money transfers with your cellphone like Mpesa.						
Q15	How often do you buy data bundles / vouchers for your cellphone						
Q16	How often do you use email on your cellphone						
Q17	How often do you watch videos /music videos on your phone (YouTube or Facebook or WhatsApp videos)						
Q18	How often do you play games on the internet with your cellphone						

C. Constructs - 5 Point Likert Scale Please rate statements on a scale of 1 - 5.							
Construct	#	Questions	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Perceived Usefulness	Q19	Cellphone applications like WhatsApp, BBM, Google, Facebook makes it easy for me to do my job					
	Q20	Using the internet on my Cell phone helps me get daily information like news weather , sports results like Soccer scores					
	Q21	Using cellphone applications like WhatsApp, Facebook, Google etc. makes my life easier and convenient					
Perceived Ease of Use	Q22	It is easy to use cellphone internet and applications on my phone					
	Q23	Cellphone applications like WhatsApp, Facebook, News24 etc. are easy to install on my phone					
	Q24	Connecting to cellphone internet and data services is long and difficult					
Subjective Norm	Q25	I use cellphone internet and mobile data applications because my friends use it as well.					
	Q26	Using cellphone applications like Facebook, Email, WhatsApp makes me feel important amongst my friends and family					
	Q27	My friends and family introduced (showed) me cellphone data applications					
Awareness	Q28	I know about most of the cellphone data applications.					
	Q29	I receive information , updates and adverts on all new cellphone applications and its use					
	Q30	My friends and family tell me or show me any new cellphone applications					
Affordability	Q31	I understand the cost and pricing plans for cellphone data services					
	Q32	I purchase data bundles/vouchers for my cellphone once a week					
Acceptability	Q33	I like cellphone data services such as the internet , Facebook, WhatsApp etc. because my friends and family also use it.					
	Q34	I trust cellphone data applications like Facebook, WhatsApp on my cellphone					
Availability	Q35	I have good cellphone signal for cellphone data services like Facebook, WhatsApp etc. in my area					
	Q36	I can buy cellphone data vouchers/bundles anywhere in my area					

Appendix C: Ethical Clearance

Gordon Institute
of Business Science
University of Pretoria

Dear Mr Yogan Govender

Protocol Number: **Temp2015-01428**

Title: **Factors influencing the adoption of mobile data at the bottom of the pyramid in South Africa**

Please be advised that your application for Ethical Clearance has been APPROVED.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,

GIBS Ethics Administrator